

Not to be cited without
permission of the authors¹

Canadian Atlantic Fisheries
Scientific Advisory Committee

CAFSAC Research Document 91/2

Ne pas citer sans
autorisation des auteurs¹

Comité scientifique consultatif des
pêches canadiennes dans l'Atlantique

CSCPCA Document de recherche 91/2

Newfoundland East and Southeast Coast Herring
- 1990 Assessment

by

J. P. Wheeler, G. B. Winters, D. E. Stansbury, and R. Chaulk
Science Branch
Department of Fisheries and Oceans
P. O. Box 5667
St. John's, Newfoundland A1C 5X1

¹ This series documents the scientific basis for fisheries management advice in Atlantic Canada. As such, it addresses the issues of the day in the time frames required and the Research Documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Research Documents are produced in the official language in which they are provided to the Secretariat by the author.

¹ Cette série documente les bases scientifiques des conseils de gestion des pêches sur la côte atlantique du Canada. Comme telle, elle couvre les problèmes actuels selon les échéanciers voulus et les Documents de recherche qu'elle contient ne doivent pas être considérés comme des énoncés finals sur les sujets traités mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée par les auteurs dans le manuscrit envoyé au secrétariat.

Abstract

Data analyses from 1990 are presented for the five herring stock complexes within the Newfoundland Region: 1) White Bay-Notre Dame Bay, 2) Bonavista Bay-Trinity Bay, 3) Conception Bay-Southern Shore, 4) St. Mary's Bay-Placentia Bay, and 5) Fortune Bay. Commercial landings totalled 8500 t, comparable with the 8100 t recorded for 1989. Commercial landings continue to be dominated by the 1982 year-class of spring spawners, with contributions also from the 1985 and 1987 year-classes. Biomass estimates are presented for Bonavista Bay-Trinity Bay from an acoustic survey conducted during the fall of 1990, and for the two southern areas, from an acoustic survey conducted during the winter of 1990. The biomass estimates have been calculated from these surveys using an experimental target strength-fish length relationship derived from net enclosed herring in Smith Sound, Trinity Bay. Research gillnet catch rates for all five stock areas were examined using the general linear model. There were significant interactions between components of the model. The relative strengths of recent year-classes, as derived from the unstandardized research gillnet catch rates at age were compared with those derived from acoustic survey population numbers at age and with those predicted from an environmental model. No year-class in any stock area is considered strong in relation to the 1968 year-class. Stock projections are presented for 1991 for three of the stock areas and management implications are discussed.

Résumé

On présente ici l'analyse des données de 1990 portant sur les cinq zones de stock de hareng de la région de Terre-Neuve, soit celles des baies de 1) White-Notre Dame; 2) Bonavista-Trinity; 3) Conception et la côte sud; 4) St. Mary's-Placentia et 5) Fortune. Les débarquements commerciaux, qui s'élevaient à 8 100 t en 1989, étaient de 8 500 t. Ils continuent d'être dominés par les géniteurs printaniers de la classe d'âge de 1982 et reçoivent aussi un apport des classes d'âge de 1985 et 1987. On présente également des estimations de la biomasse des stocks des baies Bonavista-Trinity fondées sur un relevé acoustique réalisé durant l'automne 1990 ainsi que des estimations des stocks des deux zones du sud fondées sur un relevé acoustique effectué au cours de l'hiver 1990. Ces estimations ont été établies au moyen des données des relevés acoustiques et d'un rapport expérimental entre l'effectif visé et la longueur du poisson, fondé sur du hareng capturé au filet dans le détroit Smith, baie de Trinity. On a étudié les taux de prises de la pêche d'observation au filet maillant dans les cinq zones de stocks considérées, en recourant au modèle linéaire général, et constaté d'importantes interactions entre les composantes du modèle. On a comparé la grosseur relative des récentes classes d'âge calculée d'après les taux de prises selon l'âge non standardisés de la pêche d'observation au filet maillant, à celle établie dans l'étude acoustique de la population selon l'âge et aux prévisions réalisées à partir d'un modèle environnemental. Comparativement à la classe d'âge de 1968, aucune classe d'âge n'est jugée forte dans aucune des zones de stock considérées. On présente des projections des stocks de trois des zones pour 1991 et leurs conséquences pour la gestion.

Introduction

Description of the 1990 fishery

The 1990 herring management plan provided the following allocations to each gear sector: fixed gear (gillnets and traps), bar seines and purse seines within each stock area (Fig. 1):

Stock area	Fixed gear allowance (t)	Bar seine (t)	Purse seine (t)	Reserve (t)
White Bay-Notre Dame Bay (WB-NDB)	2,000	500 500	5,000 5,000	3,500
Bonavista Bay-Trinity Bay (BB-TB)	2,000	1,000 1,000	3,000 3,000	13,000
Conception Bay-Southern Shore (CB-SS)	200	100	600 100	500
St. Mary's Bay-Placentia Bay (SMB-PB)	200	100	500 500	200
Fortune Bay (FB)	500	500	0	500
Labrador Coast	500	200	0	0
South Coast Newfoundland	500	100	0	0

As in previous years, the management plan was devised prior to the spring fishery. For each of the stock areas, a portion of the TAC was held in reserve. The fall fishery allocations included uncaught portions of the spring fishery allocations plus a portion of the reserves, where necessary. Quota transfers were permitted between the purse seine and bar seine sectors.

Nominal Catches

TAC's and landings ($\times 10^3$ t) by stock area are listed below for 1983 to 1990:

		1983	1984	1985	1986	1987	1988	1989	1990
WB-NDB	TAC	0.0	1.5	2.0	5.5	32.5	34.7	14.0	16.5
	Catch	0.4	1.5	1.8	2.8	13.5	7.3*	3.4*	4.5*
BB-TB	TAC	0.0	0.4	0.8	3.8	13.7	16.2	6.9	23.0
	Catch	0.1	0.2	0.6	1.8	6.1	10.1*	3.1*	3.0*
CB-SS	TAC	0.0	0.1	0.2	0.6	3.5	0.6	1.5	1.5
	Catch	<0.1	<0.1	0.1	0.2	1.0	0.5*	1.1*	0.3*
SMB-PB	TAC	0.0	0.0	0.6	2.1	2.5	8.9	1.5	1.5
	Catch	<0.1	0.1	0.1	0.1	0.3	1.2*	0.4*	0.5*
FB	TAC	0.0	0.0	0.3	0.7	2.4	4.7	1.5	1.5
	Catch	<0.1	<0.1	0.1	0.1	0.1	0.1*	0.1*	0.1*

* 1988-90 catches are preliminary

Anecdotal Information

As in the previous four years, quotas were not taken in any of the stock areas due to poor market conditions. Catches remained stable in three of the five stock areas, increased in White Bay-Notre Dame Bay, and decreased in the Conception Bay-Southern Shore area only (Tables 1-5). The commercial fishery continued to be concentrated during the fall in the two northern stock areas. As in 1989, there were problems reported in both of these areas with the mixing of immature fish (primarily 1987 year-class) with the larger (>300 g) herring which were being targeted by the commercial fishery. There were consistent reports from fishermen that herring were late returning to the northern bays during the fall. This was seen in the fishery as well, as most purse seine landings (Table 7) occurred after November 15. There were exceptions however, as there were concentrations of herring caught in Trinity Bay in September and in the northern part of Bonavista Bay in early November. Most of the herring taken from Notre Dame Bay were caught in the Long Island area in late November. Similarly, there were large concentrations of fish reported in the Random Island area of Trinity Bay in late December and January 1991. The fishery in the southern areas did not develop in 1990. The purse seine fishery in St. Mary's Bay-Placentia Bay continued to be prosecuted by two seiners only; their landings may have been affected by severe ice conditions in Placentia Bay in February during the fishery. The Fortune Bay fishery continued as a bait fishery only, as no purse seine vessels were licenced to fish in the area.

INPUT DATA

Biological Sampling

There were 14,712 herring sampled in 1990 from the commercial fishery and research programs (Table 6), a 3% decrease from 1989. Sampling from the fall research gillnet program was reduced from two to one sample per fisherman per week. Two samples were still collected, but were combined when choosing a representative sample to apply to a

week's catch. When apportioned by stock area, month, and gear type (Table 7), samples were available for 80% of the commercial catch. Samples were collected randomly; all fish sampled were measured and aged.

Mean weights at age for 1990 (Table 8) were derived from commercial and research samples of spring spawning herring collected from January to June.

Commercial Fishery Catch at Age

Commercial catch-at-age data (Tables 9-13, Figs. 2 and 3) were calculated for spring and autumn spawners for each stock area by applying age compositions and mean fish weights from the appropriate commercial samples to the landings.

The 1982 year-class of spring spawners continued to dominate the fishery (by number) in all stock areas, accounting for 29% to 49% of the catch. These percentages were lower than in 1989 when this year-class accounted for 33% and 66% of the catch. The 1985 year-class continued to account for approximately 20% of the commercial catch in Bonavista Bay-Trinity Bay. The 1987 year-class accounted for approximately 10% of the catch in White Bay-Notre Dame Bay, Conception Bay-Southern Shore, and St. Mary's Bay-Placentia Bay and 25% of the catch in Bonavista Bay-Trinity Bay. This is consistent with the reports of small fish (1987 year-class) in these areas during the fall purse seine fishery. More year-classes were represented in the commercial catch in St. Mary's Bay-Placentia Bay in 1990 than in previous years. However, the 1982 year-class continued to dominate as it did also in the bait fishery in Fortune Bay.

The percentage of spring spawners in the catch remained in excess of 85% in each of the three northern areas. There were increasing percentages of autumn spawners from north to south, with 28% and 35% autumn spawners respectively in St. Mary's Bay-Placentia Bay and Fortune Bay.

Research Gillnet Program

i) Program Description

The program was continued for the eleventh consecutive year during the fall in the three northern areas, for the ninth year during the spring in the two southern areas and for the sixth year during the spring in the three northern areas. The numbers of fishermen in each area remained the same as in 1989. The research gillnet data base was expanded in 1989 (Wheeler et al. 1990) to include data collected during the spring, in some areas only, from 1970 to 1982, by research personnel.

ii) Research Gillnet Catch at Age

Catches at age for each stock area were calculated by applying age distributions of samples taken during the month, at four-day intervals for the spring program and eight-day intervals for the fall program, to catches during that interval and then combining these interval age distributions into one for the entire month.

Although the 1982 year-class of spring spawners again dominated (by number) in the spring program in all areas, ranging from 28% of the catch in White Bay-Notre Dame Bay to 45% of the catch in Fortune Bay (Figs. 4 and 5), other year-classes (1985, 1986 and 1987) were generally more evident in catches in 1990.

The 1986 year-class, which accounted for 16% of the catch in St. Mary's Bay-Placentia Bay in 1989 again accounted for 10% of the catch there in 1990. The 1987 year-class accounted for between 12% and 18% of the catch in White Bay-Notre Dame Bay, Conception Bay-Southern Shore and Fortune Bay. Fish aged 11+ continued to account for >10% of the catch in all areas except Conception Bay-Southern Shore. The percentage of spring spawners remained consistently large in all areas, ranging from 73% in St. Mary's Bay-Placentia Bay to 96% in White Bay-Notre Dame Bay. There was an increase in the percentage of autumn spawners in St. Mary's Bay-Placentia Bay from 1989 to 1990, in particular for fish aged 11+.

Although the 1982 year-class of spring spawners was dominant in the catch during the fall program in Conception Bay-Southern Shore (Fig. 6), the 1987 year-class accounted for >40% of the catch in White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay. It also represented 13% of the fall catch in Conception Bay-Southern Shore. In comparison, the 1982 year-class as three-year-olds, accounted for approximately 35% of the 1985 fall catch in White Bay-Notre Dame Bay, 50% in Bonavista Bay-Trinity Bay, and 70% in Conception Bay-Southern Shore (Wheeler et al. 1989). As in 1989, the percentage of spring spawners was slightly higher than during the spring, approximately 95% for all three areas.

iii) Research Gillnet Catch Rates

This year, a detailed examination of research gillnet catch rates was conducted for each stock area using the general linear model within SAS. Analyses were conducted for all five stock areas from spring (April to June) research gillnet data. Catch rates were calculated as the number of fish caught (spring and autumn spawners combined) per day fished. There were three categories evaluated in the model: fisherman (location), week, and year.

As recommended by CAFSAC, an investigation was conducted on how occurrences of 0 catch should be treated in the model. Correction factors of 0.01, 0.10, 0.50, and 10.0 were added to all catch per unit effort values within the St. Mary's Bay-Placentia Bay data set. An interannual damping effect was observed in standardized catch rates for larger correction factors (Fig. 7), in particular in years where there were either few observations or greater occurrences of 0 catches. As interannual changes in catch rates are important in the analysis of such data, a correction factor of 0.01 was used through all subsequent analyses.

Regression coefficients by stock area and season from the main effects model were generally low:

Stock area	R ²
	Spring
WB-NDB	0.35
BB-TB	0.44
CB-SS	0.35
SMB-PB	0.35
FB	0.28

Regression coefficients increased with the full general linear model:

Stock area	R^2
	Spring
WB-NDB	0.77
BB-TB	0.67
CB-SS	0.69
SMB-PB	0.67
FB	0.59

However, for all areas and seasons, there were significant interactions between either fisherman, week or year or combinations of the three (Table 14). As the model assumes that no such interactions occur, it was uncertain how to interpret these interactions in standardized annual catch rates. These same interactions would be inherent in unstandardized catch rates. However, the research gillnet program was already standardized, i.e. as the same gear was fished in the same location at the same time each year and as there were few missing cells in the data. Therefore, until it is resolved how interactions should be interpreted, unstandardized catch rates were used to determine relative year-class sizes. Catch rates at age have been calculated by stock area, season and spawning component from the unstandardized research gillnet catch rates and catch at age (Tables 15-22).

Comparison of catch rates (converted to natural logarithms) for the fall and spring research gillnet series was only possible for the Bonavista Bay-Trinity Bay stock area. As a basis for comparison, age 3 in the fall series and age 4 in the spring series (spring spawners only) were chosen since these age-groups are basically comparable in size. Estimates of year-class size by the two series (Fig. 8) are significantly correlated ($R^2 = 0.77$) with a slope and intercept consistent with direct proportionality.

The research gillnet estimates of relative year-class abundance (i.e. Ln CPUE at ages 3 and 4) were compared with retrospective estimates of year-class size from cohort analyses using the 1990 age-specific acoustic estimates as the 1990 population vector (Fig. 9). There is a good correspondence in nearly all cases and particularly so for recent year-classes. Some of the earlier year-classes appear out of phase by one year (e.g. 1979, 1980 year-classes in White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay) but this is probably due to the low sampling rate in the 1990 acoustic surveys combined with ageing errors (these year-classes would have been ages 10 and 11 in the 1990 input vector).

Estimates of year-class size predicted from the environmental model of Winters and Wheeler (1987) were also compared with estimates from cohort analyses (Fig. 10) and research gillnets (Fig. 11). The agreement between empirical and predicted year-class strengths is very good in nearly all cases and this is particularly so for the 1982 year-class which has been the strongest year-class to appear since the very strong 1968 year-class. However, the variations in year-class strength for those involved (1977-88) is not very large (the 1982 year-class is generally less than a third of the strength of the 1968) and a better comparison of predicted estimates can be made when year-classes are classified as very weak (<10% of the 1968 year-class), weak (10-20% of

Mean weights at age were those derived from biological samples collected during January-June 1990 (Table 8). Natural mortality was assumed to be 0.20. Recruitment at age two in 1991 and 1992 was derived from 1990 the acoustic surveys population age structures. $F_{0.1}$ was assumed to be 0.30.

	BB-TB	SMB-PB	FB
x10 ³ t	1991	1991	1991
2+ biomass	37.7	14.5	7.0
Catch	6.7	3.2	1.5

No projections were calculated for White Bay-Notre Dame Bay and Conception Bay-Southern Shore.

B. Management Implications and Conclusions

Of the many parameters involved in deriving biomass estimates from acoustic surveys, two are of the critical importance: 1) the timing of the survey and 2) the application of a target strength estimate.

Ideally, herring acoustic surveys in the Newfoundland Region should be conducted during the winter when herring are in overwintering concentrations within the bays. Although the two south coast stock areas were acoustically surveyed during the winter in 1990, biomass estimates may have been biased downward due to unusually severe ice conditions in particular in St. Mary's Bay-Placentia Bay (Wheeler 1990) where ice cover precluded surveying certain areas. The two northeast coast stock areas are surveyed during the fall as ice conditions are always too great to consider conducting a winter survey of these areas. The biomass estimate from the 1990 fall survey may also have been biased downward. There is evidence both from the 1990 fall commercial fishery and from interviews with fishermen that the migration of some herring back into the bays during the fall may have been delayed until after the acoustic survey was completed. Consideration is being given to conducting the next survey of these areas later in the fall to overcome this problem.

The Smith Sound experimental target strength-fish length relationship used to estimate biomass from the 1990 acoustic surveys provided substantially smaller biomass estimates than if the relationship of Foote (1987) had been used, by a factor of 6.82 for Bonavista Bay-Trinity Bay, 5.41 for St. Mary's Bay-Placentia Bay and 4.78 for Fortune Bay. Although the Smith Sound target strength-fish length relationship was derived experimentally from net enclosed herring, the results were very consistent both with prior (1989) experimental results and with in situ estimates. Further net enclosure target strength experiments are planned for 1991 to examine seasonal changes in target strength estimates. In addition, a research cruise is planned for October 1991 specifically to derive in situ target strength estimates for comparison with those derived experimentally.

A herring management plan for 1991 has been announced with the following TAC's ($\times 10^3$ t) by stock area:

WB-NDB	11.0
BB-TB	8.0
CB-SS	1.0
SMB-PB	1.3
FB	1.0

Given the coefficients of variation associated with the biomass estimates for Bonavista Bay-Trinity Bay, St. Mary's Bay-Placentia Bay and Fortune Bay from the 1990 acoustic surveys, it was not possible to distinguish between projected 1991 catch levels and those presented in the management plan for those areas. There was no further information available for White Bay-Notre Dame Bay or Conception Bay-Southern Shore. Therefore, no changes were recommended to the 1991 management plan.

No further biological information will be available until the end of 1991, at which time data from the 1991 research gillnet program and commercial fishery will be available for review. No acoustic surveys will be conducted in 1991; the next survey is planned for January 1992 in the southern stock areas. Consequently, it was recommended that the 1991 management plan catch levels be maintained for 1992 with the provision that the White Bay-Notre Dame Bay TAC would be provisional and subject to review in early 1992.

All herring stocks within the Newfoundland Region will exhibit a gradual decline in abundance within the next few years. The 1982 year-class is of moderate strength, approximately one third the strength of the large 1968 year-class in most areas. The 1987 year-class is weaker than the 1982 year-class in all areas. The 1990 year-class was evident in White Bay-Notre Dame Bay during the 1990 fall acoustic survey, but was not evident at all in Bonavista Bay-Trinity Bay. Further evidence of the strength of this year-class will be derived from research gillnet catch rates and future acoustic surveys. However, it will be three to four years before this year-class could contribute significantly to stock biomass.

Acknowledgments

We would like to thank M. F. Dawson for administering the research gillnet program, P. J. Williams for administering the sampling program and all other Pelagic Section technical staff who aided in the collection and preparation of data used in this assessment. We are especially grateful for the efficient manner in which biological samples from 1990 were analyzed for the February Pelagic Subcommittee meeting rather than the May meeting as is normally the case. Special thanks are also extended to our typist, M. Y. Hynes.

References Cited

- Foote, K. G. 1987. Fish target strengths for use in echo integrator surveys. J. Acoust. Soc. Am. 82(3): 981-987.
- Wheeler, J. P. 1990. Newfoundland southeast coast herring - 1990 acoustic survey results. CAFSAC Res. Doc. 90/55. 50 p.
1991. Newfoundland east coast herring - 1990 acoustic survey results. CAFSAC Res. Doc. 91/1.
1989. Newfoundland east and southeast coast herring - 1988 assessment. CAFSAC Res. Doc. 89/40. 86 p.
1990. Newfoundland east and southeast coast herring - 1989 assessment. CAFSAC Res. Doc. 90/56. 43 p.
- Winters, G. H., and J. P. Wheeler. 1987. Recruitment dynamics of spring-spawning herring in the Northwest Atlantic. Can. J. Fish. Aquat. Sci. 44: 882-900.

Table 1. White Bay (W.B.)-Notre Dame Bay (N.D.B.) herring landings (t), by gear, 1975-90.

Year	Area	Gear						Total
		Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	Trap	
1975	W.B.	828	-	-	46	1209	329	2412
	N.D.B.	1183	108	-	12	1631	209	3143
	Combined	2011	108	-	58	2840	538	5555
1976	W.B.	1724	487	-	18	509	246	2984
	N.D.B.	2908	3412	-	589	2242	353	9504
	Combined	4632	3899	-	607	2751	599	12488
1977	W.B.	-	1228	-	39	268	240	1775
	N.D.B.	-	4961	-	2096	2438	355	9850
	Combined	-	6189	-	2135	2706	595	11625
1978	W.B.	-	1254	-	240	1133	331	2958
	N.D.B.	-	3980	-	306	5859	311	10456
	Combined	-	5234	-	546	6992	642	13414
1979	W.B.	-	832	-	9	978	64	1883
	N.D.B.	-	1968	-	2274	8971	598	13811
	Combined	-	2800	-	2283	9949	662	15694
1980	W.B.	-	747	-	-	1269	83	2099
	N.D.B.	-	913	-	727	2778	13	4431
	Combined	-	1660	-	727	4047	96	6530
1981	W.B.	-	220	-	14	646	23	903
	N.D.B.	-	1065	-	400	2209	107	3781
	Combined	-	1285	-	414	2855	130	4684
1982	W.B.	-	-	-	7	402	52	461
	N.D.B.	-	-	-	136	1425	1	1562
	Combined	-	-	-	143	1827	53	2023
1983	W.B.	-	15	-	-	76	7	98
	N.D.B.	-	-	-	-	329	-	329
	Combined	-	15	-	-	406	7	427
1984	W.B.	-	-	-	4	342	4	350
	N.D.B.	-	-	-	3	1115	-	1118
	Combined	-	-	-	7	1457	4	1468
1985	W.B.	-	-	-	2	564	-	566
	N.D.B.	1	-	-	9	1248	-	1258
	Combined	1	-	-	11	1812	-	1824
1986	W.B.	112	-	-	1	196	7	316
	N.D.B.	1152	-	-	86	1119	83	2440
	Combined	1264	-	-	87	1315	90	2756
1987	W.B.	4283	-	-	37	396	-	4716
	N.D.B.	6570	-	-	530	1030	650	8780
	Combined	10,853	-	-	567	1426	650	13,496
1988*	W.B.	1809	-	-	19	67	-	1895
	N.D.B.	4223	-	-	360	707	113	5403
	Combined	6032	-	-	379	774	113	7298
1989*	W.B.	648	-	-	1	113	10	772
	N.D.B.	1580	-	-	45	758	206	2589
	Combined	2228	-	-	46	871	216	3361
1990*	W.B.	217	-	-	1	88	21	327
	N.D.B.	2706	-	-	14	1317	143	4180
	Combined	2923	-	-	15	1405	164	4507

* provisional

Table 2. Bonavista Bay (B.B.) - Trinity Bay (T.B.) herring landings (t), by gear, 1975-90.

Year	Area	Gear					Total
		Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	
1975	B.B.	1559	-	-	34	414	2009
	T.B.	1370	1790	-	242	411	3903
	Combined	2929	1790	-	276	825	5912
1976	B.B.	2812	3052	-	24	328	6355
	T.B.	1614	1054	-	465	419	3582
	Combined	4426	4106	-	489	747	9937
1977	B.B.	-	6223	236	2495	309	9263
	T.B.	-	1548	-	927	174	2694
	Combined	-	7771	236	3422	483	11,957
1978	B.B.	-	4239	-	150	1320	5712
	T.B.	-	1055	-	966	308	2337
	Combined	-	5294	-	1116	1628	8049
1979	B.B.	-	3490	-	377	2374	6245
	T.B.	-	1181	-	1615	680	3531
	Combined	-	4671	-	1992	3054	9776
1980	B.B.	-	1714	-	652	1321	3687
	T.B.	-	964	-	405	336	1718
	Combined	-	2678	-	1057	1657	5405
1981	B.B.	-	1100	-	713	1399	3219
	T.B.	-	78	-	361	367	825
	Combined	-	1178	-	1074	1766	4044
1982	B.B.	-	-	-	-	386	390
	T.B.	-	-	-	25	76	107
	Combined	-	-	-	25	462	497
1983	B.B.	-	-	-	-	52	52
	T.B.	-	-	-	27	17	44
	Combined	-	-	-	27	69	96
1984	B.B.	-	-	-	-	135	135
	T.B.	-	-	-	-	41	41
	Combined	-	-	-	-	176	176
1985	B.B.	-	-	-	4	290	296
	T.B.	-	-	-	2	312	320
	Combined	-	-	-	6	602	616
1986	B.B.	767	-	-	7	362	1141
	T.B.	356	-	-	30	233	624
	Combined	1123	-	-	37	595	1765
1987	B.B.	4762	-	-	72	218	5052
	T.B.	838	-	-	15	175	1029
	Combined	5600	-	-	87	393	6081
1988*	B.B.	5951	-	-	280	172	6403
	T.B.	3207	-	-	273	94	3659
	Combined	9158	-	-	553	266	10062
1989*	B.B.	610	-	-	11	85	706
	T.B.	2151	-	-	141	54	2352
	Combined	2761	-	-	152	139	3058
1990*	B.B.	729	-	-	19	108	863
	T.B.	1319	-	-	715	80	2144
	Combined	2048	-	-	734	188	3007

* provisional

Table 3. Conception Bay (C.B.)- Southern Shore (S.S.) herring landings (t), by gear, 1975-90.

Year	Area	Gear						Total
		Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	Trap	
1975	C.B.	13	2281	-	388	166	24	2872
	S.S.	315	-	-	23	160	169	667
	Combined	328	2281	-	411	326	193	3539
1976	C.B.	-	1704	258	76	153	92	2283
	S.S.	-	44	-	-	8	149	201
	Combined	-	1748	258	76	161	241	2484
1977	C.B.	-	1248	-	58	174	12	1492
	S.S.	-	442	-	-	18	200	660
	Combined	-	1690	-	58	192	212	2152
1978	C.B.	-	1098	-	11	415	3	1527
	S.S.	-	133	-	14	78	193	418
	Combined	-	1231	-	25	493	196	1945
1979	C.B.	-	432	-	-	210	63	705
	S.S.	-	10	-	18	49	111	188
	Combined	-	442	-	18	259	174	893
1980	C.B.	-	319	-	16	107	1	443
	S.S.	-	-	-	-	2	32	34
	Combined	-	319	-	16	109	33	477
1981	C.B.	-	-	-	-	160	2	162
	S.S.	-	-	-	-	53	8	61
	Combined	-	-	-	-	213	10	223
1982	C.B.	-	-	-	-	84	1	85
	S.S.	-	-	-	-	7	5	12
	Combined	-	-	-	-	91	6	97
1983	C.B.	-	-	-	-	17	-	17
	S.S.	-	-	-	-	-	-	-
	Combined	-	-	-	-	17	-	17
1984	C.B.	-	-	-	-	49	-	49
	S.S.	-	-	-	-	-	-	-
	Combined	-	-	-	-	49	-	49
1985	C.B.	-	-	-	-	81	-	81
	S.S.	-	-	-	-	16	-	16
	Combined	-	-	-	-	97	-	97
1986	C.B.	76	-	-	-	102	1	179
	S.S.	-	-	-	1	23	1	25
	Combined	76	-	-	1	125	2	204
1987	C.B.	580	-	-	187	185	10	962
	S.S.	-	-	-	-	15	3	18
	Combined	580	-	-	187	200	13	980
1988*	C.B.	414	-	-	1	35	2	452
	S.S.	1	-	-	-	8	72	81
	Combined	415	-	-	1	45	74	533
1989*	C.B.	1007	-	-	-	61	-	1068
	S.S.	1	-	-	-	9	1	11
	Combined	1008	-	-	-	70	1	1079
1990*	C.B.	261	-	-	-	53	-	314
	S.S.	-	-	-	-	12	-	12
	Combined	261	-	-	-	65	-	326

* provisional

Table 4. St. Mary's Bay (SMB)-Placentia Bay (PB) herring landings (t), by gear, 1975-90.

Year	Area	Gear					Total
		Purse seine	Ringnet	Bar seine	Gillnet	Trap	
1975	S.M.B.	1032	711	554	674	243	3214
	P.B.	2638	-	225	450	188	3501
	Combined	3670	711	779	1124	431	6715
1976	S.M.B.	-	920	158	352	25	1455
	P.B.	2056	172	242	177	-	2647
	Combined	2056	1092	400	529	25	4102
1977	S.M.B.	-	1131	221	531	29	1912
	P.B.	740	524	14	78	-	1356
	Combined	740	1655	235	609	29	3268
1978	S.M.B.	-	1523	66	490	3	2082
	P.B.	557	612	29	214	33	1445
	Combined	557	2135	95	704	36	3527
1979	S.M.B.	-	1570	131	332	9	2042
	P.B.	359	891	17	307	1	1575
	Combined	359	2461	148	639	10	3617
1980	S.M.B.	-	645	16	352	12	1025
	P.B.	182	892	9	339	30	1452
	Combined	182	1537	25	691	42	2477
1981	S.M.B.	-	44	8	122	-	174
	P.B.	-	311	-	149	1	461
	Combined	-	355	8	271	1	635
1982	S.M.B.	-	-	-	10	-	10
	P.B.	-	-	4	31	-	35
	Combined	-	-	4	41	-	45
1983	S.M.B.	-	-	-	13	-	13
	P.B.	-	-	-	27	-	27
	Combined	-	-	-	40	-	40
1984	S.M.B.	-	-	-	11	-	11
	P.B.	-	-	1	95	-	96
	Combined	-	-	1	106	-	107
1985	S.M.B.	-	-	1	31	-	32
	P.B.	3	-	-	113	-	116
	Combined	3	-	1	144	-	148
1986	S.M.B.	4	-	-	17	-	21
	P.B.	-	-	2	107	-	109
	Combined	4	-	2	124	-	130
1987	S.M.B.	33	-	5	47	5	90
	P.B.	-	-	1	161	-	162
	Combined	33	-	6	208	5	252
1988*	S.M.B.	-	-	-	25	-	25
	P.B.	1020	-	8	177	-	1205
	Combined	1020	-	8	202	-	1230
1989*	S.M.B.	-	-	-	8	-	8
	P.B.	213	-	2	127	2	344
	Combined	213	-	2	135	2	352
1990*	S.M.B.	-	-	-	18	-	18
	P.B.	379	-	-	144	-	523
	Combined	379	-	-	162	-	541

* provisional

Table 5. Fortune Bay herring landings (t), by gear, 1975-90.

Year	Gear				Total
	Purse seine	Bar seine	Gillnet	Trap	
1975	809	81	19	-	909
1976	109	310	43	-	462
1977	188	364	22	5	579
1978	104	854	41	-	999
1979	285	829	81	-	1195
1980	97	265	89	-	451
1981	-	30	37	-	67
1982	-	-	20	2	22
1983	-	-	15	-	15
1984	-	-	21	-	21
1985	-	-	52	-	52
1986	1	1	92	-	94
1987	-	2	144	-	146
1988*	2	2	86	-	90
1989*	-	3	104	2	109
1990*	-	-	92	-	92

* provisional

Table 6. Number of fish sampled from the Newfoundland herring fishery, by area and gear, 1985-90 (research samples in parenthesis).

Year	Area	Gear type				Midwater trawl	Total sampled	Comm. catch (t)
		Trap	Bar seine	Gillnet	Ringnet			
1985	WB	175	-	580 (1047)	-		755 (1047)	566
	NDB	-	100	994 (1200)	(237)		1094 (1437)	1258
	BB	-	-	1048 (2036)	(350)		1048 (2386)	296
	TB	-	-	536 (1000)	(317)		536 (1317)	320
	CB	26	-	450 (800)	(150)		476 (950)	81
	SS	-	-	100 (500)	-		100 (500)	16
	SMB	-	-	50 (598)	50		100 (598)	32
	PB	-	-	92 (697)	50		142 (697)	116
	FB	-	-	500 (900)	(250)		500 (1150)	52
	Total	201	100	4350 (8778)	100 (1304)		4751 (10082)	2737
1986	WB	-	-	(1150)	100		100 (1150)	316
	NDB	77	50	600 (1222)	50 (400)		777 (1622)	2440
	BB	150	-	400 (1949)	389 (150)		939 (2099)	1141
	TB	150	100	400 (800)	150 (700)		800 (1500)	624
	CB	150 (236)	-	344 (1010)	(100)		494 (1346)	179
	SS	-	-	(579)	-		(579)	25
	SMB	50	-	100 (850)	150		300 (850)	21
	PB	50	-	582 (558)	(350)		632 (908)	109
	FB	-	-	286 (1338)	(100)		286 (1438)	94
	Total	627 (236)	150	2712 (9456)	839 (1800)		4328 (11492)	4949
1987	WB	-	-	350 (850)	246		596 (850)	4716
	NDB	250	-	300 (1174)	583 (313)		1133 (1487)	8780
	BB	50	-	265 (1592)	546 (169)		861 (1761)	5052
	TB	-	100	196 (1100)	386 (50)		682 (1150)	1029
	CB	50 (200)	-	150 (500)	200		400 (700)	962
	SS	50	-	95 (250)	-		145 (250)	18
	SMB	-	50 (200)	50 (800)	50		150 (1000)	90
	PB	-	-	200 (786)	-		200 (786)	162
	FB	-	-	191 (1300)	-		191 (1300)	146
	Total	400 (200)	150 (200)	1797 (8352)	2011 (532)		4358 (9284)	20955
1988	WB	-	-	50 (1229)	200		250 (1229)	1895
	NDB	46	-	349 (1817)	300 (600)		695 (2417)	5403
	BB	-	-	297 (2320)	400		697 (2320)	6403
	TB	100	100	200 (1100)	300		700 (1100)	3659
	CB	50	-	178 (1213)	141		369 (1213)	452
	SS	94	-	- (377)	-		94 (377)	81
	SMB	-	-	98 (731)	48		146 (731)	26
	PB	-	-	134 (846)	136		270 (846)	1204
	FB	-	-	194 (1246)	-		194 (1246)	90
	Total	290	100	1500 (10879)	1525 (600)		3415 (11479)	19213
1989	WB	-	-	133 (1742)	100		233 (1742)	772
	NDB	50	-	196 (2562)	300		546 (2562)	2589
	BB	-	-	148 (1995)	150		298 (1995)	706
	TB	100 (100)	50	200 (1817)	200 (100)		550 (2017)	2352
	CB	-	-	204 (1044)	150		354 (1044)	1068
	SS	-	-	99 (342)	-		99 (342)	11
	SMB	-	-	100 (687)	-		100 (687)	8
	PB	-	-	100 (794)	200		300 (794)	344
	FB	-	-	237 (1226)	-		237 (1226)	109
	Total	150 (100)	50	1417 (12209)	1100 (100)		2717 (12409)	7959
1990	WB	-	-	127 (1355)	50 (200)	(79)	177 (1634)	326
	NDB	-	50	250 (1889)	350 (200)	(224)	659 (2313)	4180
	BB	-	-	100 (1277)	400 (100)	(50)	500 (1427)	862
	TB	-	100 (568)	150 (1610)	200 (36)	(6)	450 (2220)	2144
	CB	-	-	44 (1223)	99	-	143 (1223)	314
	SS	-	-	37 (192)	-	-	37 (192)	12
	SMB	-	-	50 (747)	-	-	50 (747)	18
	PB	-	-	87 (698)	171 (71)	200	258 (969)	524
	FB	-	-	90 (1283)	(200)	149	90 (1632)	93
	TOTAL		150 (568)	935 (10274)	1270 (807)	(708)	2355 (12357)	8473

* 1988-90 catches are provisional

Table 7. Commercial catch (t) and sampling (number of fish) for 1990, by stock area, month, and gear type.

Month	Gear	WB-NDB		BB-TB		CB-SS		SMB-PB		FB	
		Catch	No. sampled	Catch	No. sampled	Catch	No. sampled	Catch	No. sampled	Catch	No. sampled
January	Gillnet	-	-	-	-	-	-	-	-	1	-
	Purse seine	-	-	252	50	-	-	191	-	-	-
February	Gillnet	-	-	-	-	-	-	-	-	-	-
	Purse seine	-	-	-	-	-	-	188	171	-	-
March	Gillnet	-	-	-	-	-	-	2	-	2	-
	Purse seine	-	-	-	-	-	-	-	-	-	-
April	Gillnet	54	50	24	-	36	-	61	45	31	50
	Bar seine	-	-	32	-	-	-	-	-	-	-
	Purse seine	99	50	162	50	8	50	-	-	-	-
May	Gillnet	729	139	81	100	18	81	58	92	48	40
	Trap	19	-	9	-	-	-	-	-	-	-
	Bar seine	13	50	457	50	-	-	-	-	-	-
	Purse seine	261	-	86	100	-	-	-	-	-	-
June	Gillnet	420	88	19	-	6	-	37	-	11	-
	Trap	124	-	8	-	-	-	-	-	-	-
	Bar seine	1	-	181	-	-	-	-	-	-	-
	Purse seine	72	-	-	-	-	-	-	-	-	-
July	Gillnet	75	-	3	-	1	-	1	-	-	-
	Trap	-	-	-	-	-	-	-	-	-	-
August	Gillnet	11	-	2	-	-	-	-	-	-	-
	Trap	-	-	-	-	-	-	-	-	-	-
	Purse seine	-	-	-	-	-	-	-	-	-	-
September	Gillnet	9	-	6	100	1	-	-	-	-	-
	Trap	1	-	21	-	-	-	-	-	-	-
	Bar seine	1	-	40	50	-	-	-	-	-	-
	Purse seine	4	-	331	50	-	-	-	-	-	-
October	Gillnet	56	100	22	-	-	-	-	-	-	-
	Trap	13	-	-	-	-	-	-	-	-	-
	Bar seine	-	-	7	-	-	-	-	-	-	-
	Purse seine	398	100	180	50	94	-	-	-	-	-
November	Gillnet	48	-	21	50	-	-	-	-	-	-
	Trap	8	-	-	-	-	-	-	-	-	-
	Bar seine	-	-	17	-	-	-	-	-	-	-
	Purse seine	1992	200	492	200	69	-	-	-	-	-
December	Gillnet	2	-	9	-	-	-	1	-	-	-
	Trap	-	-	-	-	-	-	-	-	-	-
	Bar seine	-	-	-	-	-	-	-	-	-	-
	Purse seine	97	50	547	100	90	49	-	-	-	-
Combined	Gillnet	1404	377	187	250	62	81	160	137	93	90
	Trap	165	-	38	-	-	-	-	-	-	-
	Bar seine	15	50	734	100	-	-	-	-	-	-
	Purse seine	2923	400	2050	600	261	99	379	171	-	-
TOTAL		4507	827	3009	950	323	180	539	308	93	90

Table 8. Mean weight at age (g) of Newfoundland spring spawning herring from samples collected January-June, 1990. Sample sizes in parenthesis.

Age	Stock area				
	WB-NDB	BB-TB	CB-SS	SMB-FB	FB
0	-	-	-	-	-
1	-	-	-	30 (3)	-
2	-	70 (8)	-	87 (8)	102 (1)
3	122 (293)	144 (227)	173 (161)	162 (148)	145 (393)
4	179 (152)	219 (138)	250 (127)	242 (186)	215 (16)
5	234 (158)	262 (376)	271 (117)	273 (63)	252 (3)
6	259 (72)	272 (51)	282 (12)	291 (16)	268 (1)
7	279 (475)	285 (204)	303 (62)	311 (44)	292 (52)
8	296 (696)	314 (962)	329 (474)	343 (667)	322 (716)
9	329 (43)	353 (19)	349 (15)	362 (43)	339 (47)
10	336 (126)	362 (37)	359 (27)	367 (184)	356 (162)
11+	418 (333)	421 (178)	426 (56)	406 (122)	421 (148)

Table 9. Commercial catch at age of spring and autumn spawning herring for White Bay-Notre Dame Bay, 1970-90.

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	10	1	5	1	1	2	56	50	1	1	115
	3	1	129	290	727	4	128	24	1671	55	60	46
	4	12	88	2396	1411	123	215	506	107	2034	50	1240
	5	24	161	353	2825	3142	453	237	468	317	2928	92
	6	24	64	69	761	5446	5438	868	184	1034	323	1080
	7	972	425	122	719	1193	7069	10893	793	517	1410	17
	8	11	10184	403	654	697	1123	17145	7363	2509	767	496
	9	83	233	1363	416	1506	838	1328	12675	10807	2222	179
	10	159	254	205	1685	858	810	3364	1055	11756	14413	1450
	11+	275	3105	808	794	2378	3999	8535	15707	14379	27508	14653
Total SS		1572	14645	6015	9995	15349	20076	42957	40074	43410	49683	19369
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	53	1	1	6	1	1	1	1	71
	4	1	1	17	7	11	64	31	45	6	1	13
	5	26	6	74	22	124	3	35	35	24	10	13
	6	10	14	79	25	10	25	51	85	155	267	23
	7	39	11	67	60	48	16	20	54	171	172	272
	8	60	26	1	25	2	21	40	1	24	160	4
	9	20	17	164	13	46	3	46	94	2	133	19
	10	11	19	81	97	7	2	4	1	130	1	1
	11+	172	291	562	298	346	302	329	182	238	298	450
Total AS		342	388	1100	550	597	444	559	500	753	1045	868
Total AS & SS		1914	15033	7115	10545	15946	20520	43516	40572	44163	50728	20237
% SS		82.1	97.4	84.5	94.8	96.3	97.8	98.7	98.8	98.3	97.9	95.7
% AS		17.9	2.6	15.5	5.2	3.7	2.2	1.3	1.2	1.7	2.1	4.3
	Age	1981	1982	1983	1984	1985	1986	1987	1988*	1989*	1990*	
Spring spawners	1	1	1	1	1	1	195	26	2848	1	1	
	2	445	76	1	6	3	29	1105	401	12	1	
	3	152	371	38	12	187	975	324	1074	115	1559	
	4	41	332	46	124	350	2945	7201	299	311	233	
	5	1231	59	23	1218	240	308	25843	2939	61	558	
	6	63	268	14	73	1486	667	1651	11655	1775	213	
	7	805	34	93	114	108	1258	1067	1012	5731	2324	
	8	64	258	1	157	275	198	2088	1128	173	6574	
	9	344	19	26	37	94	162	399	1422	566	458	
	10	194	192	4	122	81	179	442	315	532	1015	
	11+	10908	4059	805	1938	2110	1973	4566	2840	1143	1041	
Total SS		14248	5669	1052	3802	4935	8888	44712**	25933***	10420	13977	
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	
	2	1	1	1	1	1	1	1	1	1	1	
	3	1	72	1	1	1	10	2	1	1	1	
	4	13	26	74	60	29	67	297	97	64	100	
	5	86	62	25	409	94	69	469	111	12	59	
	6	11	16	23	66	333	79	156	44	5	43	
	7	1	12	1	30	137	373	112	20	199	86	
	8	100	9	1	8	32	68	630	7	18	4	
	9	1	42	6	7	23	6	152	578	-	-	
	10	4	1	1	3	10	1	10	6	203	4	
	11+	65	23	1	24	74	42	108	303	17	446	
Total AS		284	265	135	610	735	713	1935	1169	521	745	
Total AS & SS		14532	5934	1187	4412	5670	9601	46647	27102	1094	14722	
% SS		98.0	95.5	88.6	86.2	87.0	92.6	95.9	95.7	95.2	94.9	
% AS		2.0	4.5	11.4	13.8	13.0	7.4	4.1	4.3	4.8	5.1	

* preliminary

** 4475 age 0's in 1987 SS not included

*** 10 age 0's in 1988 SS not included

Table 10. Commercial catch at age of spring and autumn spawning herring for Bonavista Bay-Trinity Bay, 1970-90.

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	5	10	1	1	1
	2	1	1	1	1	1	1	14	16	22	6	15
	3	1	690	10	1	1	392	77	248	26	286	13
	4	1	311	1347	60	2	134	493	135	357	167	195
	5	9	102	389	4887	235	163	123	759	122	765	43
	6	55	64	91	126	4795	2564	166	227	251	19	293
	7	808	361	75	96	424	14330	4897	50	112	436	52
	8	35	1373	88	1	151	455	20697	6209	598	101	264
	9	126	151	480	48	294	995	909	23206	4412	530	75
	10	69	126	14	271	69	727	854	774	13394	5575	967
	11+	212	522	213	1	1849	1679	4306	5890	5956	19994	12259
Total SS		1318	3702	2709	5488	7822	21441	32539	37524	25251	27880	14177
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	1	1	10	1	1	1	14
	4	9	1	1	1	1	26	22	55	16	1	11
	5	1	10	1	1	1	30	77	16	14	27	17
	6	1	1	1	1	1	1	23	176	61	114	83
	7	4	4	2	1	16	22	66	86	58	30	188
	8	17	23	2	48	2	41	34	112	28	175	45
	9	18	3	5	1	1	6	62	30	23	13	112
	10	17	21	1	1	1	19	8	73	82	16	3
	11+	738	406	33	1	1216	259	1069	1069	417	800	463
Total AS		808	472	49	58	1242	407	1373	1620	702	1179	938
Total AS & SS		2126	4174	2758	5546	9064	21848	33912	39114	25953	29059	15115
% SS		62.0	88.7	98.2	99.0	86.3	98.1	96.0	95.9	97.3	95.9	93.8
% AS		38.0	11.3	1.8	1.0	13.7	1.9	4.0	4.1	2.7	4.1	6.2
	Age	1981	1982	1983	1984	1985	1986	1987	1988*	1989*	1990*	
Spring spawners	1	1	1	1	1	1	151	296	267	1	1	
	2	136	1	1	4	13	207	1352	2923	368	48	
	3	246	8	4	22	175	443	413	8190	510	2617	
	4	53	11	34	35	70	4445	2845	185	2035	361	
	5	256	2	7	210	87	261	16208	3037	188	1991	
	6	26	30	2	9	351	161	334	20858	836	65	
	7	288	5	15	5	37	262	359	853	5571	542	
	8	23	35	1	12	27	38	126	811	12	3752	
	9	321	5	8	2	13	10	33	8	106	134	
	10	88	65	2	2	22	31	6	27	79	234	
	11+	11762	1186	159	154	797	657	956	802	372	379	
Total SS		13200	1349	234	456	1593**	6665	22928***	37961	10078	10124	
Autumn spawners	1	1	1	1	1	1	1	19	1	1	1	
	2	1	1	1	1	1	1	1	97	1	1	
	3	6	3	1	1	1	1	1	26	1	5	
	4	115	1	10	3	5	51	2	15	50	110	
	5	106	8	2	84	18	80	391	73	108	44	
	6	33	10	5	14	203	59	237	398	76	5	
	7	83	3	2	17	96	292	87	177	129	52	
	8	283	8	1	3	54	149	360	156	17	43	
	9	36	25	1	5	22	24	138	673	39	49	
	10	4	1	1	1	10	1	2	2	366	17	
	11+	230	37	3	9	29	30	156	192	116	68	
Total AS		898	98	28	139	440	686	1391	1810	904	395	
Total AS & SS		14098	1447	262	595	2033	7351	24319	39771	10982	10519	
% SS		93.6	93.2	89.3	76.6	78.4	90.7	94.3	95.4	91.8	96.2	
% AS		6.4	6.8	10.7	23.4	21.6	9.3	5.7	4.6	8.2	3.8	

* preliminary

** 10 age 0's in 1985 SS not included

*** 3124 age 0's in 1987 SS not included

Table 11. Commercial catch at age of spring and autumn spawning herring for Conception Bay-Southern Shore, 1970-90.

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	67	4	9	1177	7	1	1	1
	3	1	36	7	2	1	418	28	127	1	4	1
	4	15	31	1625	34	5	30	97	5	99	9	3
	5	17	19	134	4521	122	16	23	101	32	34	1
	6	21	11	55	242	9655	2057	31	45	65	7	19
	7	255	43	29	329	153	8592	2330	13	14	38	1
	8	12	272	79	142	83	120	4771	950	3	4	12
	9	13	26	361	44	39	517	89	4241	734	31	1
	10	11	11	67	175	13	238	252	49	3080	270	49
	11+	46	65	122	28	658	891	714	959	1358	1640	1101
Total SS		393	516	2481	5585	10734	12889	9513	6498	5388	2039	1190
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	2	7	1	1	1	1	1
	4	1	1	1	2	3	162	1	7	4	2	1
	5	1	1	1	2	8	40	49	29	50	17	1
	6	8	1	1	1	6	81	27	150	30	80	1
	7	20	1	1	38	17	18	23	87	69	15	32
	8	36	6	1	35	1	49	23	72	9	57	3
	9	5	34	1	1	6	11	31	13	10	17	6
	10	6	11	1	1	1	14	12	7	34	6	1
	11+	114	89	1	94	45	318	193	373	282	245	32
Total AS		194	147	11	177	91	702	362	741	491	442	80
Total AS & SS		587	663	2492	5762	10825	13591	9875	7239	5879	2481	1270
% SS		67.0	77.8	99.6	96.9	99.2	94.8	93.6	89.8	91.6	82.2	93.7
% AS		33.0	22.2	0.4	3.1	0.8	5.2	3.7	10.2	8.4	17.8	6.3
	Age	1981	1982	1983	1984	1985	1986	1987	1988*	1989*	1990*	
Spring spawners	1	1	1	1	1	1	1	714	22	1	1	1
	2	1	1	1	1	1	6	1	2	581	1	1
	3	25	2	1	3	58	1	36	175	689	87	1
	4	4	5	1	27	11	389	73	47	1130	36	1
	5	26	1	1	47	11	7	3486	518	14	49	1
	6	9	2	1	5	17	13	17	966	107	1	1
	7	28	1	1	1	2	16	26	99	1497	57	1
	8	3	5	1	2	2	3	10	48	10	434	1
	9	14	1	1	1	1	1	2	4	36	18	1
	10	13	1	1	1	1	3	1	1	2	24	1
	11+	504	176	13	7	97	81	65	89	108	81	1
Total SS		628	196	23	96	202	518	4431	1971	4175	789	1
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	9	1	1	1	23	1	1	289	1	1
	4	14	5	1	4	3	7	7	1	1	3	1
	5	8	14	2	60	6	18	37	49	1	10	1
	6	3	1	3	6	52	21	27	141	3	4	1
	7	7	1	1	6	24	94	32	112	52	2	1
	8	14	2	2	3	13	29	32	61	13	2	1
	9	2	2	5	1	3	10	21	42	6	15	1
	10	1	1	1	1	1	3	13	1	32	18	1
	11+	9	5	12	1	15	10	8	1	16	89	1
Total AS		61	42	30	85	120	214	175	411	415	146	1
Total AS & SS		689	238	53	181	322	732	6114	2382	4590	935	1
% SS		91.1	82.4	43.4	53.0	62.7	70.8	96.2	82.7	91.0	84.4	1
% AS		8.9	17.6	56.6	47.0	37.3	29.2	3.8	17.1	9.0	15.6	1

* preliminary

Table 12. Commercial catch at age of spring and autumn spawning herring for St. Mary's Bay-Placentia Bay, 1970-90.

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	3	1	1	1	3	1	1	1	1	1	1
	2	476	1	1	76	995	74	365	52	30	87	133
	3	109	557	207	326	280	2234	391	1423	175	663	332
	4	4434	116	20375	77	234	471	1906	140	1817	279	133
	5	59	2111	725	15470	126	147	208	736	123	2263	153
	6	76	80	5154	566	14328	1591	267	87	596	96	1270
	7	645	251	365	6757	436	13858	862	50	64	614	57
	8	66	45	650	93	6049	146	5622	1039	106	85	470
	9	72	13	352	224	138	3391	201	3830	512	66	38
	10	37	22	73	193	238	350	2256	134	3827	501	237
	11+	107	96	403	315	624	1323	1361	2448	2185	4785	2971
Total SS		6084	3293	28306	24098	23451	23586	13440	9940	9436	9440	5795
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	24	5	2	1	11	1	1	1	1
	4	1	9	61	150	2	7	4	47	23	11	96
	5	2	2	175	52	96	68	214	52	435	143	35
	6	1	53	15	71	146	182	67	209	92	598	52
	7	71	31	61	10	80	89	32	81	244	73	419
	8	112	43	37	54	95	206	17	69	122	216	79
	9	19	84	101	17	93	6	94	26	38	21	126
	10	28	35	71	68	51	37	11	22	52	2	25
	11+	202	314	539	737	970	677	329	526	561	348	492
Total AS		439	574	1086	1166	1537	1275	781	1035	1570	1415	1327
Total AS & SS		6523	3867	29392	25264	24988	24861	14221	10975	11006	10855	7122
% SS		93.3	85.2	96.3	95.4	93.8	94.9	94.5	90.6	85.7	87.0	81.4
% AS		6.7	14.8	3.7	4.6	6.2	5.1	5.5	9.4	14.3	13.0	18.6
	Age	1981	1982	1983	1984	1985	1986	1987	1988*	1989*	1990*	
Spring spawners	1	1	1	1	1	1	1	1	1		1	1
	2	1	1	1	8	1	1	34	1		22	1
	3	193	1	5	9	7	1	19	1		45	115
	4	42	2	2	24	18	143	2	30		7	189
	5	111	3	3	36	27	19	502	205		1	64
	6	51	8	2	6	21	28	29	2723		21	15
	7	338	3	4	3	15	9	47	139		388	30
	8	28	14	1	24	3	4	9	282		30	494
	9	80	4	9	1	25	1	3	16		85	45
	10	6	4	1	10	5	5	1	53		4	172
	11+	466	69	39	44	125	30	11	167		28	128
Total SS		1317	110	68	166	248	238	656	3618		632	1254
Autumn spawners	1	1	1	1	1	1	1	1	1		1	1
	2	1	1	1	1	1	1	2	1		1	1
	3	1	1	1	1	1	1	4	1		5	7
	4	139	1	18	17	9	16	12	28		5	37
	5	116	7	6	101	20	24	32	25		18	61
	6	10	1	12	32	86	15	80	236		5	54
	7	11	1	4	21	46	97	30	74		48	24
	8	50	1	1	5	36	28	82	29		40	47
	9	7	1	1	3	10	16	24	295		56	58
	10	1	1	1	1	3	4	3	5		148	17
	11+	29	2	4	8	24	15	12	70		142	173
Total AS		366	18	50	191	237	215	281	765		469	480
Total AS & SS		1683	128	118	357	485	453	937	4383		1101	1734
% SS		78.3	85.9	57.6	46.5	51.1	52.5	70.0	82.5		57.4	72.3
% AS		21.7	14.1	42.4	53.5	48.9	47.5	30.0	17.5		42.6	27.7

* preliminary

Table 13. Commercial catch at age of spring and autumn spawning herring for Fortune Bay, 1970-90.

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	617	23	1	1	1	1	1	1	1
	2	29475	167	1515	2210	389	2	82	27	1	1	25
	3	5988	23223	256	925	1314	277	15	2103	42	1	16
	4	11953	6086	19690	67	552	581	318	25	2677	183	3
	5	133	23525	2896	5694	130	112	228	327	62	3833	69
	6	281	1165	10767	475	4435	87	129	166	237	15	1122
	7	7894	5747	351	1712	250	1490	11	26	43	165	7
	8	233	3514	4432	73	1094	16	338	43	139	5	183
	9	16	132	991	282	36	142	36	188	52	24	1
	10	225	148	34	558	117	22	188	4	326	1	11
	11+	257	537	366	173	255	201	140	244	302	167	50
Total SS		56456	64245	41915	12192	8573	2931	1486	3154	3882	4396	1488
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	7	1	7	1	1	1	1
	4	1	598	1	48	9	22	9	23	1	7	4
	5	334	1	84	50	87	12	38	19	36	5	3
	6	1	136	25	79	65	39	26	19	6	50	3
	7	443	175	185	8	12	19	13	1	25	1	3
	8	816	769	44	32	27	20	1	1	12	17	1
	9	412	626	310	15	5	11	27	1	6	12	1
	10	1	470	125	27	1	7	1	1	1	1	1
	11+	2201	1956	793	97	85	45	9	2	18	12	1
Total AS		4212	4734	1570	359	300	178	133	70	108	108	20
Total AS & SS		60668	68979	43485	12551	8873	3109	1619	3224	3990	4504	1508
% SS		93.1	93.1	96.4	97.1	96.6	94.3	91.8	97.8	97.3	97.6	98.7
% AS		6.9	6.9	3.6	2.9	3.4	5.7	8.2	2.2	2.7	2.4	1.3
	Age	1981	1982	1983	1984	1985	1986	1987	1988*	1989*	1990*	
Spring spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	2	1	1	1	1	1	1	1
	3	144	1	2	1	54	1	1	1	1	1	1
	4	16	3	2	4	3	145	1	1	1	1	1
	5	4	3	1	3	39	4	304	1	1	1	2
	6	3	1	1	2	12	69	11	225	18	2	2
	7	21	2	1	1	2	20	49	7	283	12	12
	8	2	36	1	2	1	6	18	27	31	155	155
	9	23	1	10	1	1	1	4	6	21	17	17
	10	1	5	1	2	1	2	1	1	28	20	20
	11+	12	5	18	23	15	14	38	10	29	1	1
Total SS		228	59	39	42	130	264	429	281	415	213	
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	5	1	1	1	1	1	1	1	1	1	1
	4	64	1	1	1	17	3	1	2	3	10	10
	5	16	7	1	9	4	8	4	1	6	5	5
	6	1	2	2	4	26	16	7	5	1	12	12
	7	1	1	1	6	12	38	11	5	6	17	17
	8	1	1	1	1	7	12	25	1	31	7	7
	9	1	1	1	1	4	5	10	13	3	54	54
	10	1	1	1	1	1	1	5	1	17	1	1
	11+	1	1	1	1	2	5	14	11	5	5	5
Total AS		93	18	12	27	76	91	80	42	75	114	
Total AS & SS		321	77	51	69	206	355	509	323	490	327	
% SS		71.0	76.6	76.5	60.9	63.1	74.4	84.3	87.0	84.7	65.1	
% AS		29.0	23.4	23.5	39.1	36.9	25.6	15.7	13.0	15.3	34.9	

* preliminary

Table 14. Summary of full general linear model results for spring research gillnet program, White Bay-Notre Dame Bay (AB), Bonavista Bay-Trinity Bay (CD), Conception Bay-Southern Shore (EF), St. Mary's Bay-Placentia Bay (GH), and Fortune (I).

STOCK=AB

DEPENDENT VARIABLE: CPUE_01					
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	76	9969.19945583	131.17367705	58.84	0.0
ERROR	249	555.06866528	2.22919143		ROOT MSE
UNCORRECTED TOTAL	325	10524.26812111			1.49304770
					CPUE_01 MEAN
					4.99821267
					R-SQUARE
					0.769210
					C.V.
					29.8716

SOURCE	DF	TYPE III SS	F VALUE	PR > F
INTERCEPT	1	3875.00472967	1738.30	0.0
YEAR	3	267.34588355	39.98	0.0001
WEEK	6	72.62510704	4.07	0.0001
YEAR*WEEK	14	144.98538227	4.65	0.0001
FISHMAN	5	195.04425767	17.50	0.0001
YEAR*FISHMAN	8	223.69954948	12.54	0.0001
WEEK*FISHMAN	25	238.09251952	4.27	0.0001
YEAR*WEEK*FISHMAN	12	142.43119854	5.32	0.0001

STOCK=CD

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F
MODEL	123	8042.93688717	65.38972429	12.06	0.0
ERROR	375	2032.60711928	5.42028565		ROOT MSE
UNCORRECTED TOTAL	498	10075.54320645			2.32815069
					CPUE_01 MEAN
					2.81240639
					R-SQUARE
					0.668770
					C.V.
					82.7814

SOURCE	DF	TYPE III SS	F VALUE	PR > F
INTERCEPT	1	1100.19563678	202.98	0.0001
YEAR	10	145.98482767	2.69	0.0034
WEEK	10	320.02652301	5.90	0.0001
YEAR*WEEK	26	166.01171660	1.18	0.2525
FISHMAN	8	288.53658762	6.65	0.0001
YEAR*FISHMAN	11	219.77116159	3.69	0.0001
WEEK*FISHMAN	31	538.36339785	3.20	0.0001
YEAR*WEEK*FISHMAN	19	210.08744684	2.04	0.0065

Table 14. Continued ...

26

STOCK=EF							
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	75	5786.57422209	77.15432296	12.55	0.0	0.687505	72.0360
ERROR	193	1186.74560180	6.14894094		ROOT MSE		CPUE_01 MEAN
UNCORRECTED TOTAL	268	6973.31982388			2.47970582		3.44231449
STOCK=GH							
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	218	16055.19305326	73.64767456	12.99	0.0	0.670920	83.4866
ERROR	725	4111.55618187	5.67111197		ROOT MSE		CPUE_01 MEAN
UNCORRECTED TOTAL	943	20166.74923513			2.38140966		2.85244556
STOCK=I							
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	119	11292.24748356	94.89283600	9.75	0.0	0.592286	90.0117
ERROR	377	3670.43853832	9.73591124		ROOT MSE		CPUE_01 MEAN
UNCORRECTED TOTAL	496	14962.68602188			3.12024218		3.46648672
STOCK=J							
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
INTERCEPT	1	872.10798986	89.58	0.0001			
YEAR	8	1473.00874520	18.91	0.0001			
WEEK	9	175.95167473	2.01	0.0374			
YEAR*WEEK	43	945.63483640	2.26	0.0001			
FISHMAN	2	223.98813119	11.50	0.0001			
YEAR*FISHMAN	12	519.58273511	4.45	0.0001			

Table 15. Unstandardized research gillnet catch rates at age (numbers per days fished) by spawning type, for White Bay - Notre Dame Bay, spring program.

Stock: WBNDB Season: SPRING UNSTANDARDIZED
CATCH RATES

AUTUMN SPAWNERS

Age	1971	1988	1989	1990
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.1	0.0
4	0.0	0.0	0.0	2.5
5	0.0	0.8	7.4	2.7
6	2.2	1.4	2.0	2.5
7	0.0	0.8	4.8	0.9
8	3.9	0.7	4.8	1.5
9	1.9	4.8	6.9	2.1
10	0.0	0.1	21.7	0.2
11	41.8	1.5	18.6	17.5
Total	49.8	10.1	66.4	29.2

SPRING SPAWNERS

Age	1971	1988	1989	1990
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	5.0	17.5	91.0
4	24.9	2.0	47.1	56.2
5	3.9	23.9	12.2	57.7
6	22.3	63.9	138.3	17.8
7	27.5	6.0	199.2	157.6
8	1010.9	5.0	10.6	213.1
9	14.4	12.9	17.5	12.6
10	28.8	1.9	26.5	28.9
11	176.8	36.6	61.4	105.8
Total	1309.5	157.0	529.7	740.1

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1971	1988	1989	1989
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	5.0	17.5	91.0
4	24.9	2.0	47.1	58.8
5	3.9	24.7	19.6	60.4
6	24.5	65.3	140.2	20.3
7	27.5	6.8	203.9	158.6
8	1014.8	5.7	15.4	214.6
9	16.3	17.7	24.4	14.7
10	28.8	2.0	48.2	29.0
11	218.6	38.1	80.0	123.3
Total	1359.3	167.1	596.1	769.3

Table 16. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, White Bay - Notre Dame Bay, fall program.

Stock:	WBNDB		Season:	FALL		UNSTANDARDIZED CATCH RATES					
AUTUMN SPAWNERS											
Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
3	3.3	0.3	7.0	0.0	14.0	0.0	0.0	0.0	0.1	0.0	1.3
4	0.4	1.0	3.4	14.2	2.1	1.5	2.9	15.7	2.2	0.7	4.5
5	1.5	0.0	3.8	1.6	40.9	1.5	3.9	20.3	3.2	0.4	1.6
6	1.8	0.4	3.3	4.2	10.2	13.9	3.3	15.1	1.5	0.1	0.4
7	1.8	0.0	0.0	1.4	1.3	7.6	10.2	2.8	0.8	2.6	0.3
8	0.1	0.3	0.0	0.2	1.1	0.0	2.6	8.5	0.4	0.7	0.4
9	0.2	0.0	1.5	0.3	0.3	0.0	0.4	2.9	1.7	0.0	0.5
10	0.0	0.0	0.0	0.9	0.2	0.0	0.0	2.1	0.4	2.2	0.3
11	4.3	0.3	0.4	1.9	3.3	2.3	1.3	1.1	1.0	1.7	1.9
Total	13.3	2.2	19.5	24.7	73.4	26.8	24.6	68.6	11.6	8.4	11.2

SPRING SPAWNERS

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
2	9.8	4.5	8.5	0.5	23.3	2.6	0.2	1.2	5.7	5.2	3.2
3	8.1	5.2	29.1	50.1	6.4	134.5	9.0	0.6	3.9	10.8	120.9
4	204.1	1.2	5.6	81.4	19.1	19.0	107.3	38.8	3.6	20.1	21.1
5	7.2	25.2	3.5	7.3	84.0	11.6	12.5	352.0	18.0	7.6	7.0
6	92.2	1.0	1.9	14.1	4.2	60.1	9.0	35.1	90.4	39.2	3.5
7	2.7	5.3	0.8	19.8	8.5	7.1	38.2	16.0	7.8	123.8	12.1
8	29.5	0.5	9.3	2.6	14.0	6.7	3.8	57.3	6.6	4.1	51.8
9	4.5	1.9	0.0	22.4	0.8	7.5	2.6	8.6	13.3	12.2	7.3
10	34.0	0.8	15.5	5.2	8.5	5.2	3.1	5.5	1.2	25.6	10.8
11	503.9	83.7	192.6	318.7	254.8	119.5	50.2	102.3	27.0	41.9	33.5
Total	895.0	129.4	266.8	521.6	424.0	373.5	235.9	616.4	177.9	290.7	270.0

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
2	9.8	4.5	8.5	0.5	23.3	2.6	0.2	1.2	5.9	5.2	3.2
3	11.3	5.4	36.1	50.1	20.4	134.5	9.0	0.6	4.0	10.8	122.3
4	204.5	2.2	9.0	95.5	21.2	20.5	110.2	54.5	5.8	20.8	25.5
5	8.6	25.2	7.3	8.9	124.8	13.1	16.4	372.3	21.2	8.0	8.6
6	94.0	1.4	5.2	18.3	14.4	74.0	12.3	50.2	91.9	39.3	3.9
7	4.5	5.3	0.8	21.2	9.8	14.7	48.4	18.8	8.6	126.4	12.5
8	29.6	0.8	9.3	2.8	15.1	6.7	6.4	65.8	7.0	4.8	52.3
9	4.7	1.9	1.5	22.7	1.1	7.5	3.0	11.5	15.1	12.2	7.8
10	34.0	0.8	15.5	6.1	8.7	5.2	3.1	7.7	1.7	27.8	11.1
11	508.2	84.0	193.0	320.6	258.1	121.9	51.6	103.4	28.0	43.6	35.4
Total	908.3	131.6	286.3	546.3	497.4	400.3	260.5	685.0	189.5	299.1	281.2

Table 17. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, Bonavista Bay - Trinity Bay, spring program.

Stock:	BBTB	Season:		SPRING	UNSTANDARDIZED CATCH RATES									
AUTUMN SPAWNERS														
Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	0.0	0.0	0.0	2.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4	0.0	0.0	10.2	13.0	0.0	6.6	0.0	0.0	0.0	0.3	0.0	0.1	0.0	
5	0.2	0.0	0.0	4.8	0.7	0.6	39.0	0.5	0.0	0.0	0.3	0.3	0.4	
6	0.0	0.0	10.2	2.1	3.1	0.6	6.3	10.9	0.6	0.3	0.2	0.3	0.2	
7	0.0	0.0	29.4	2.4	0.0	0.0	0.0	1.9	0.8	0.4	0.2	1.9	0.9	
8	0.0	0.0	4.7	2.1	0.0	0.6	0.0	1.3	0.2	1.3	0.0	1.3	1.2	
9	0.0	0.0	35.8	0.7	0.7	0.0	0.4	0.0	0.0	0.7	0.5	0.5	1.2	
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	3.3	0.1	
11	0.6	10.2	71.5	1.7	1.4	2.8	2.1	0.7	0.0	0.0	0.3	2.4	7.3	
Total	0.8	10.2	161.4	28.8	5.9	12.1	47.8	15.5	1.6	3.1	1.5	10.1	11.3	
SPRING SPAWNERS														
Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0.1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.6	0.3	0.1	0.1	0.0	
3	1.6	2.6	0.0	19.9	3.1	4.4	20.2	18.3	0.9	1.2	5.8	2.3	8.8	
4	15.5	483.5	17.3	4.6	1.4	35.8	8.2	7.6	151.6	1.2	0.3	21.8	8.2	
5	2.5	220.8	0.0	1.7	0.3	1.2	37.7	4.3	2.4	104.5	2.3	0.9	27.7	
6	2.6	14.4	53.1	1.5	1.0	0.0	3.5	11.2	2.6	1.5	30.0	5.5	4.5	
7	13.9	44.4	0.0	5.2	0.0	0.7	0.7	1.0	3.1	0.0	0.5	57.7	12.2	
8	80.2	56.2	3.5	0.0	0.7	0.0	2.2	1.0	0.9	0.0	0.4	0.9	60.8	
9	4.1	331.9	0.0	4.2	0.3	9.8	0.0	1.0	0.3	0.3	0.6	0.6	0.8	
10	10.6	5.2	41.4	5.9	0.3	1.6	2.2	1.1	0.2	0.7	0.0	0.7	3.2	
11	13.9	147.7	575.0	166.7	56.3	181.0	146.4	39.3	10.8	6.4	12.5	5.5	8.9	
Total	145.1	1306.8	650.2	209.4	63.5	233.8	221.8	84.8	174.2	116.0	52.6	96.0	135.1	
SPRING AND AUTUMN SPAWNERS COMBINED														
Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0.1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.6	0.3	0.1	0.1	0.0	
3	1.6	2.6	0.0	22.0	3.1	5.5	20.2	18.3	0.9	1.2	5.8	2.3	8.8	
4	15.5	483.5	27.4	17.6	1.4	42.4	8.2	7.6	151.6	1.5	0.3	21.9	8.3	
5	2.7	220.8	0.0	6.5	1.0	1.8	76.7	4.8	2.4	104.5	2.6	1.2	28.1	
6	2.6	14.4	63.3	3.5	4.1	0.6	9.9	22.1	3.2	1.8	30.2	5.8	4.7	
7	13.9	44.4	29.4	7.6	0.0	0.7	0.7	2.9	4.0	0.4	0.7	59.6	13.0	
8	80.2	56.2	8.1	2.1	0.7	0.6	2.2	2.3	1.1	1.3	0.4	2.2	62.0	
9	4.1	331.9	35.8	4.9	1.0	9.8	0.4	1.0	0.3	1.1	1.1	1.1	2.1	
10	10.6	5.2	41.4	5.9	0.3	1.6	2.2	1.2	0.2	0.7	0.0	4.0	3.3	
11	14.5	157.9	646.5	168.4	57.7	183.8	148.5	40.0	10.8	6.4	12.8	7.9	16.2	
Total	145.9	1317	851.6	238.2	69.4	245.9	269.6	100.3	175.8	119.1	54.1	106.1	146.4	

Table 18. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, Bonavista Bay - Trinity Bay, fall program.

Stock:	BBTB		Season:		FALL		UNSTANDARDIZED CATCH RATES					
AUTUMN SPAWNERS												
Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	
3	0.8	0.0	20.3	0.2	0.4	0.4	0.2	0.0	0.1	0.2	0.4	
4	1.2	1.3	3.3	33.6	1.2	0.9	0.7	0.3	0.5	0.2	1.6	
5	0.5	0.2	10.9	8.5	23.3	0.8	2.4	0.7	0.9	0.4	0.5	
6	1.2	0.2	0.4	10.0	5.0	8.8	2.8	0.7	1.1	0.9	0.2	
7	2.5	0.2	1.8	2.3	4.9	3.8	7.7	0.5	0.6	0.8	0.4	
8	0.6	2.4	0.1	1.5	0.5	0.8	2.0	2.8	0.1	0.5	0.2	
9	0.3	0.0	5.3	0.6	1.9	0.3	1.3	0.7	1.3	0.1	0.4	
10	0.0	0.0	0.0	4.4	0.0	0.0	0.1	0.1	0.4	0.8	0.0	
11	2.0	1.2	5.6	4.5	4.4	1.2	1.0	0.6	1.7	0.5	0.5	
Total	9.0	5.5	47.7	65.5	41.6	17.0	18.1	6.5	6.8	4.2	4.2	

SPRING SPAWNERS

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.1	0.0
2	20.6	1.3	4.6	1.0	18.3	2.2	2.4	3.7	4.9	9.7	1.8
3	1.3	1.9	73.0	8.1	7.6	50.3	5.8	0.3	14.7	3.0	39.9
4	12.8	0.2	19.8	101.9	7.4	4.0	109.9	4.4	1.5	10.3	10.2
5	0.9	0.8	5.0	11.0	57.3	1.8	2.1	43.9	6.3	1.1	8.3
6	4.3	0.2	14.6	4.3	2.3	8.0	2.2	1.9	50.9	4.2	0.5
7	0.3	1.6	0.1	11.5	1.3	5.1	4.6	1.7	1.9	20.8	2.9
8	0.9	0.0	3.0	0.2	2.0	0.1	0.6	1.6	1.6	0.5	13.4
9	0.1	1.2	0.0	4.5	0.0	0.6	0.1	0.5	1.1	1.0	1.3
10	1.9	0.1	0.6	1.0	1.9	0.0	0.8	0.2	0.2	1.0	1.2
11	101.2	61.8	64.8	95.9	44.6	17.6	10.4	6.3	3.9	2.4	4.4
Total	144.1	69.0	185.2	239.2	142.6	85.1	138.7	64.4	87.6	54.0	84.0

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.1	0.0
2	20.6	1.3	4.6	1.0	18.3	2.2	2.4	3.7	5.1	9.7	2.0
3	2.1	1.9	93.3	8.3	8.0	50.7	6.0	0.3	14.8	3.2	40.2
4	14.0	1.5	23.1	135.5	8.6	4.9	110.6	4.7	2.0	10.5	11.7
5	1.4	1.0	15.9	19.5	80.6	2.6	4.5	44.6	7.2	1.5	8.8
6	5.5	0.4	15.0	14.3	7.3	16.8	5.0	2.7	52.0	5.1	0.7
7	2.8	1.8	1.9	13.8	6.2	8.9	12.3	2.2	2.5	21.6	3.4
8	1.5	2.4	3.1	1.7	2.5	0.9	2.6	4.4	1.7	1.0	13.7
9	0.4	1.2	5.3	5.1	1.9	0.9	1.4	1.2	2.4	1.1	1.6
10	1.9	0.1	0.6	5.3	1.9	0.0	0.9	0.3	0.6	1.7	1.2
11	103.1	63.0	70.4	100.4	49.0	18.8	11.4	6.9	5.6	2.9	4.8
Total	153.1	74.5	232.9	304.7	184.2	102.1	156.8	70.9	94.4	58.2	88.2

Table 19. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, Conception Bay - Southern Shore, spring program.

Stock: CBSS		Season: SPRING		UNSTANDARDIZED CATCH RATES			
AUTUMN SPAWNERS							
Age	1980	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.2	0.0	0.0	0.5
4	0.0	0.9	0.3	1.2	0.0	0.1	2.5
5	0.0	1.3	4.7	1.4	6.5	0.4	1.7
6	0.0	26.6	10.3	3.9	12.1	1.5	0.8
7	0.0	20.8	66.9	6.8	20.3	3.2	0.1
8	0.0	16.7	20.2	9.3	9.9	5.2	1.6
9	0.0	3.4	12.5	1.3	20.1	0.6	1.2
10	0.0	1.9	0.7	2.4	0.1	4.8	0.0
11	0.0	27.1	29.8	4.3	3.7	1.9	3.8
Total	0.0	98.9	145.5	31.5	72.7	17.8	12.3

SPRING SPAWNERS

Age	1980	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.3	0.0	0.0
3	0.0	8.4	0.0	19.1	5.9	16.2	19.2
4	0.0	1.5	121.9	2.5	26.4	25.3	11.7
5	0.0	6.5	3.3	180.2	22.5	13.9	9.0
6	0.0	18.6	22.8	8.3	725.2	20.4	1.2
7	0.9	2.6	5.6	13.7	32.3	110.0	5.6
8	0.0	2.2	4.3	4.5	69.5	7.4	49.8
9	0.0	0.5	1.3	3.2	9.8	6.5	1.7
10	0.9	0.0	1.3	1.3	2.0	1.4	2.4
11	42.2	130.6	57.6	85.5	84.2	31.1	5.5
Total	44.0	171.0	217.3	317.9	978.7	232.0	106.3

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1980	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.3	0.0	0.0
3	0.0	8.4	0.0	20.2	5.9	16.2	19.7
4	0.0	2.4	122.2	3.7	26.4	25.4	14.2
5	0.0	7.8	7.9	181.6	29.0	14.3	10.7
6	0.0	45.2	33.1	12.1	737.3	21.9	2.0
7	0.9	23.3	72.6	20.4	52.6	113.2	5.8
8	0.0	18.9	24.6	13.7	79.4	12.7	51.4
9	0.0	3.9	13.8	4.4	29.9	7.1	2.9
10	0.9	1.9	2.0	3.7	2.0	6.2	2.5
11	42.2	157.7	87.4	89.8	87.9	33.0	9.3
Total	44.0	269.9	362.8	349.4	1051.4	249.8	118.6

Table 20. Unstandardized research gillnet catch rates at age (numbers per days fished) by spawning type, Conception Bay - Southern Shore, fall program.

Stock: CBSS		Season: FALL				UNSTANDARDIZED CATCH RATES		
AUTUMN SPAWNERS								
Age	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0		0.0	0.0	0.0
2	1.9	0.0	0.0	0.0		0.0	0.4	0.0
3	0.2	7.3	4.4	0.1		0.1	0.3	0.0
4	4.6	6.2	12.8	2.4		0.0	0.0	0.1
5	0.8	213.5	7.5	4.0		0.3	0.3	0.1
6	1.3	39.5	53.6	2.6		0.2	0.0	0.0
7	0.1	10.4	16.6	9.2		0.7	0.2	0.0
8	0.1	1.1	11.0	4.1		0.6	0.1	0.3
9	1.1	1.7	0.0	2.1		5.4	0.0	0.2
10	0.0	1.1	0.1	1.1		1.1	0.3	0.0
11	0.7	1.4	6.4	0.5		0.4	0.2	0.1
Total	10.7	282.0	112.4	26.1		8.8	2.0	0.8

SPRING SPAWNERS								
Age	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	1.5		0.0	0.0	0.0
2	2.3	80.0	1.1	0.9		14.3	41.7	0.1
3	1.2	18.7	461.0	0.4		118.2	6.3	2.1
4	2.1	68.0	26.0	34.9		4.2	12.2	0.5
5	0.2	130.2	14.7	2.3		6.5	0.6	4.3
6	0.3	8.7	18.1	2.4		295.6	0.7	0.3
7	0.3	7.0	0.1	1.6		8.8	11.8	0.3
8	0.0	13.3	1.1	0.2		10.6	0.4	6.6
9	0.3	0.0	1.1	0.5		0.9	0.3	0.6
10	0.3	0.0	0.0	0.6		0.0	0.7	0.8
11	7.3	88.7	41.8	3.0		2.8	0.9	0.3
Total	14.3	414.5	565.0	48.3		461.8	75.6	16.0

SPRING AND AUTUMN SPAWNERS COMBINED								
Age	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	1.5		0.0	0.0	0.0
2	4.2	80.0	1.1	0.9		14.3	42.2	0.1
3	1.4	26.0	465.4	0.5		118.3	6.7	2.1
4	6.7	74.2	38.8	37.3		4.2	12.2	0.7
5	1.0	343.6	22.2	6.3		6.8	0.9	4.4
6	1.6	48.2	71.7	5.0		295.8	0.7	0.3
7	0.4	17.5	16.7	10.8		9.5	12.0	0.3
8	0.1	14.4	12.1	4.3		11.2	0.5	6.9
9	1.4	1.7	1.1	2.6		6.3	0.3	0.8
10	0.3	1.1	0.1	1.7		1.1	1.0	0.8
11	8.0	90.1	48.2	3.5		3.2	1.1	0.4
Total	25.0	696.5	677.4	74.4		470.6	77.6	16.8

Table 21. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, St. Mary's Bay - Placentia Bay, spring program.

Stock: SMBPB

Season: SPRING

UNSTANDARDIZED
CATCH RATES

AUTUMN SPAWNERS

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.6	0.5	6.2	0.9	0.7	2.0	0.0	0.1	0.1
4	0.9	8.4	0.2	0.6	10.3	10.8	36.8	8.0	4.6	1.1	1.8	1.0
5	23.0	0.6	0.0	2.0	1.9	53.2	14.2	16.6	8.2	1.2	3.8	4.5
6	1.3	28.3	1.2	0.2	5.3	15.9	39.0	10.2	14.9	2.9	1.5	2.8
7	29.4	10.9	1.4	0.0	1.0	22.8	14.4	42.2	8.5	5.2	3.8	2.9
8	58.7	9.5	4.8	0.2	0.5	1.5	12.2	10.4	20.6	5.0	2.8	3.3
9	20.3	17.4	0.0	0.1	0.8	4.1	1.5	3.6	7.5	8.3	2.0	6.7
10	9.1	6.9	0.3	0.0	0.4	0.8	2.5	1.5	0.7	1.2	5.0	2.0
11	40.0	43.2	21.9	0.5	2.6	13.5	10.9	4.5	4.6	4.4	4.3	29.7
Total	182.7	125.2	29.9	4.1	23.2	128.6	132.5	97.8	71.5	29.2	24.9	52.9

SPRING SPAWNERS

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.2	1.8	0.7	0.0	0.0	0.0	0.4	0.2	0.1
3	6.7	230.3	0.6	0.2	11.3	18.5	59.2	0.3	13.7	2.3	23.5	11.2
4	627.5	35.0	0.0	0.6	2.0	21.7	5.9	125.6	1.7	4.2	6.0	19.5
5	71.5	420.5	243.1	0.4	1.0	6.9	9.9	8.5	151.9	2.7	1.8	5.7
6	56.7	37.0	4.8	1.4	1.1	2.7	6.9	17.4	11.6	100.3	3.5	2.4
7	278.0	178.9	39.9	0.2	3.5	0.9	2.4	3.5	17.7	6.2	64.3	5.0
8	87.7	33.9	0.3	1.7	0.4	7.3	2.1	2.6	4.0	14.4	3.3	69.9
9	18.9	13.4	1.2	0.4	5.2	0.2	8.6	0.1	2.1	3.0	12.6	2.4
10	62.1	15.4	8.2	0.4	0.6	10.1	2.7	2.4	0.6	0.1	3.1	16.7
11	139.0	64.8	4.8	6.5	21.5	46.7	45.4	12.1	7.4	7.2	4.9	6.8
Total	1349.4	1028.1	302.4	11.9	48.4	115.6	143.1	172.5	210.4	140.9	123.3	139.5

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.2	1.8	0.7	0.0	0.0	0.0	0.4	0.2	0.1
3	6.7	230.3	0.6	0.8	11.8	24.7	60.2	1.0	15.7	2.3	23.6	11.3
4	628.4	43.3	0.2	1.2	12.3	32.5	42.7	133.6	6.3	5.3	7.8	20.5
5	94.5	421.1	243.1	2.3	2.9	60.2	24.1	25.1	160.1	3.9	5.6	10.2
6	58.0	65.3	6.1	1.6	6.4	18.6	45.8	27.6	26.4	103.2	4.9	5.1
7	307.4	189.8	41.4	0.2	4.5	23.7	16.9	45.7	26.2	11.4	68.1	7.9
8	146.4	43.4	5.1	1.9	0.9	8.8	14.3	13.0	24.6	19.4	6.1	73.2
9	39.2	30.8	1.2	0.5	6.0	4.3	10.0	3.7	9.6	11.2	14.6	9.0
10	71.2	22.3	8.5	0.4	1.0	10.8	5.2	3.9	1.3	1.3	8.0	18.7
11	179.0	108.0	26.8	7.0	24.1	60.2	56.2	16.6	11.9	11.6	9.2	36.5
Total	1532.1	1153.3	332.3	16.0	71.6	244.2	275.6	270.3	281.9	170.1	148.2	192.4

Table 22. Unstandardized research gillnet catch rates at age (numbers per days fished)
by spawning type, Fortune Bay, spring program.

Stock: FB

Season: SPRING

UNSTANDARDIZED
CATCH RATES

AUTUMN SPAWNERS

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	7.5	2.2
4	0.0	0.0	0.3	18.0	0.0	13.9	8.5	0.1	0.2	0.2	6.6
5	0.0	0.0	1.4	6.0	27.5	7.9	5.0	3.3	0.1	3.7	1.0
6	0.0	2.1	0.2	20.6	10.5	74.2	9.3	4.0	3.0	1.4	2.0
7	0.0	4.2	0.0	2.0	17.3	38.7	28.3	4.5	3.8	11.2	1.4
8	8.2	1.4	0.0	1.1	3.6	17.5	9.0	25.6	3.0	8.9	4.7
9	2.8	14.1	0.0	0.5	0.9	13.9	2.0	10.0	12.1	3.1	9.4
10	0.0	2.1	0.0	0.0	0.2	3.3	1.0	5.2	1.1	20.8	0.5
11	6.8	12.7	0.1	0.7	3.1	6.0	1.7	17.3	13.8	24.8	19.6
Total	17.8	36.7	2.0	48.9	63.0	175.3	64.9	69.9	37.2	81.4	47.4

SPRING SPAWNERS

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3	0.0	10.4	0.6	8.4	0.0	14.4	0.0	0.0	0.0	12.2	98.8
4	122.4	13.8	0.8	6.0	19.6	2.8	224.5	0.0	0.0	0.9	1.4
5	5.6	168.3	0.6	3.9	13.2	205.4	8.8	532.1	3.1	0.9	0.0
6	16.7	15.2	0.1	3.1	5.4	69.5	70.0	11.7	419.7	15.9	0.0
7	236.5	31.5	0.2	2.4	1.2	15.8	48.4	48.3	9.8	664.7	6.2
8	2.8	86.4	6.0	2.7	3.6	4.6	10.0	20.7	50.5	15.0	236.8
9	5.6	0.0	0.3	44.0	0.3	8.8	0.8	4.8	11.3	65.4	19.7
10	0.0	6.2	0.8	4.6	3.9	6.5	2.0	1.4	2.1	33.7	59.0
11	8.3	13.8	0.8	53.7	90.6	135.8	36.0	71.8	19.6	125.3	56.1
Total	397.5	345.6	10.3	128.7	137.9	463.6	400.1	690.2	515.6	934.9	479.4

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3	0.0	10.4	0.6	8.4	0.0	14.5	0.0	0.0	0.0	19.6	101.0
4	122.4	13.8	1.1	24.0	19.6	16.6	233.0	0.1	0.2	1.1	8.1
5	5.6	168.3	2.0	9.9	40.7	213.2	13.8	535.4	3.2	4.6	1.0
6	16.7	17.3	0.3	23.7	15.8	143.7	79.3	15.7	422.7	17.3	2.0
7	236.5	35.6	0.2	4.5	18.5	54.5	76.7	52.8	13.6	675.9	7.6
8	11.0	87.8	6.0	3.8	7.2	22.2	19.0	46.3	53.5	23.8	241.5
9	8.3	14.1	0.3	44.5	1.2	22.7	2.8	14.8	23.5	68.5	29.0
10	0.0	8.3	0.8	4.6	4.1	9.8	3.0	6.6	3.2	54.4	59.4
11	15.2	26.5	0.9	54.4	93.7	141.8	37.7	89.1	33.4	150.1	75.7
Total	415.3	382.3	12.3	177.6	200.9	638.9	465.0	760.1	552.8	1016.3	526.8

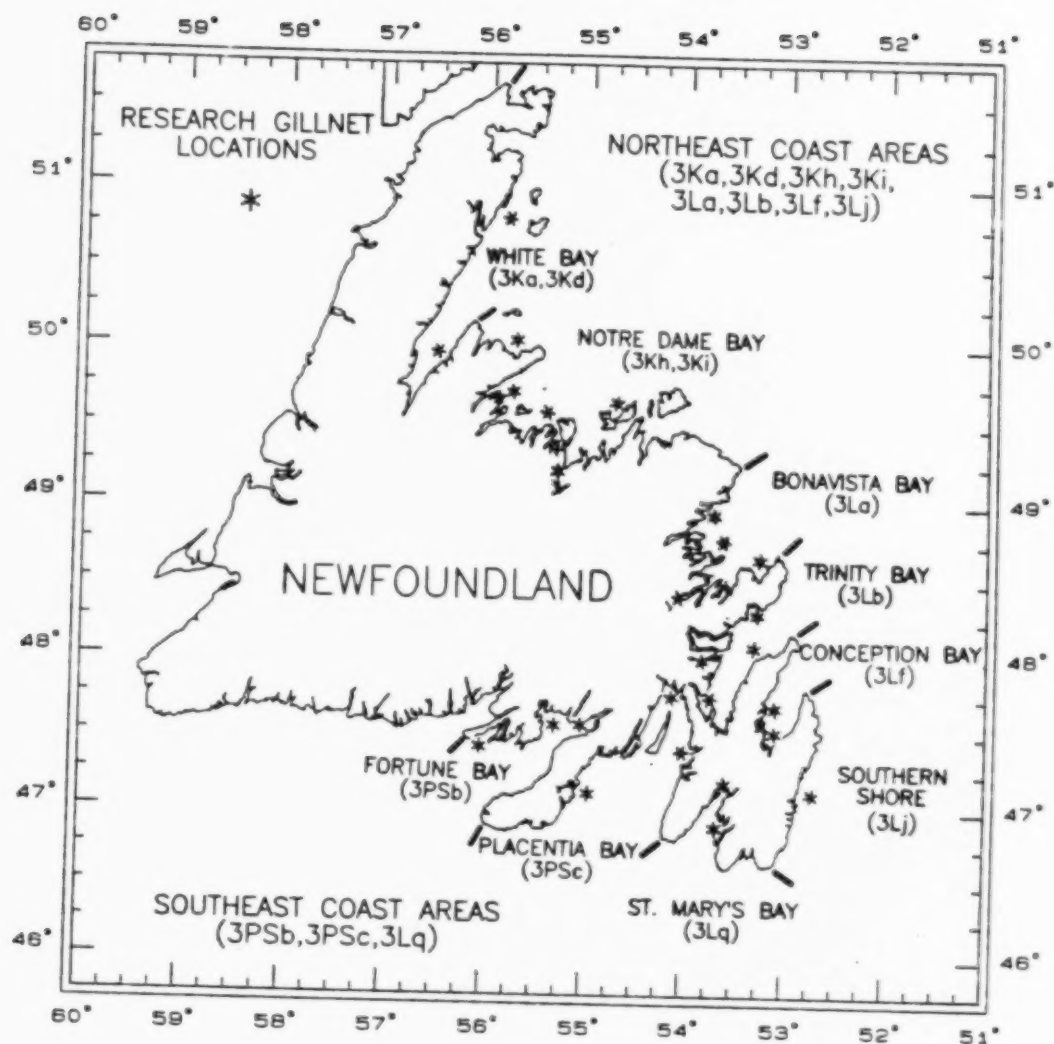


Fig. 1. Area map indicating herring stock complexes and research gillnet locations within the Newfoundland region.

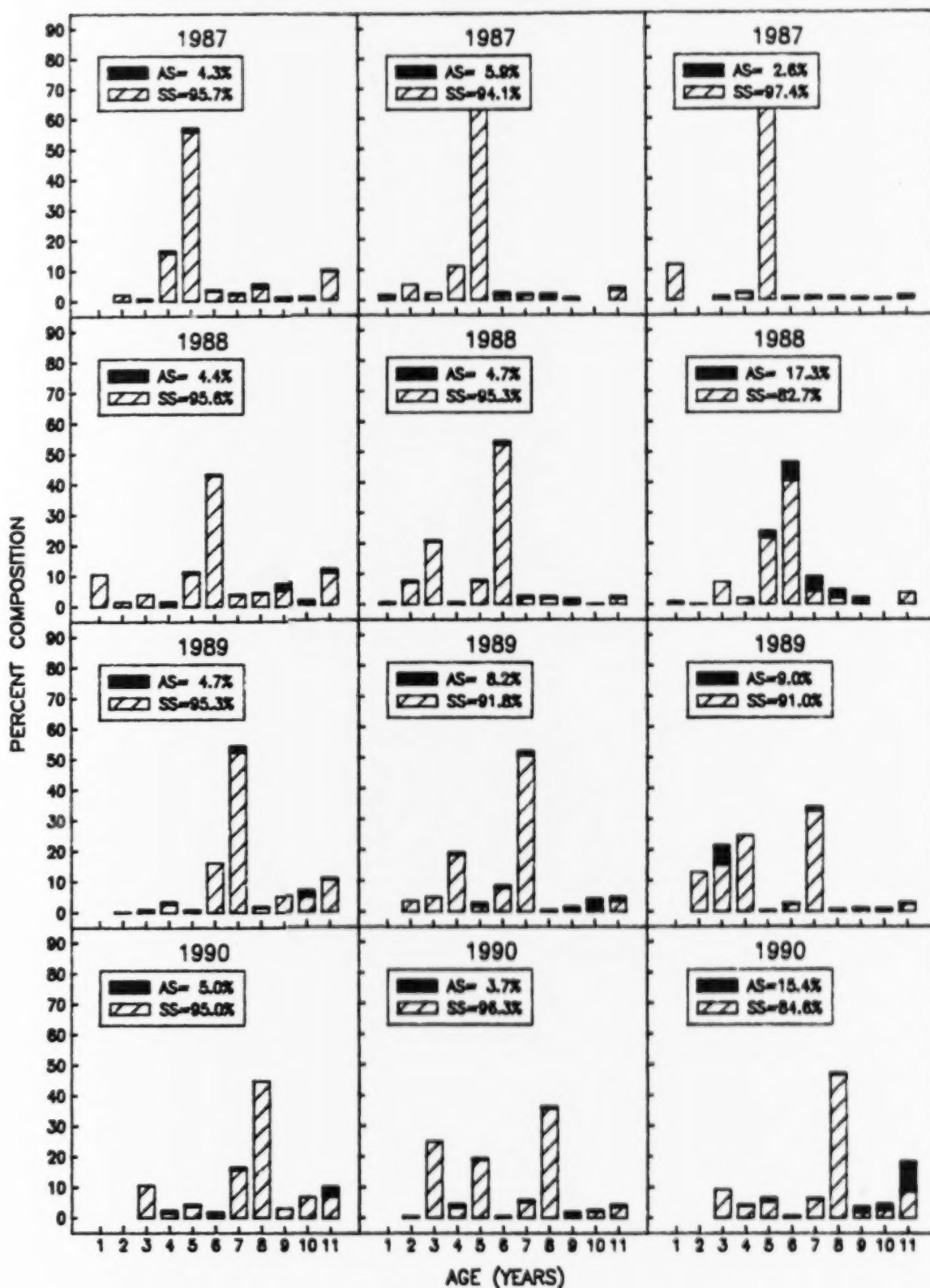


Fig.2. Age composition of herring from the commercial fishery, White Bay - Notre Dame Bay (WB-NDB), Bonavista Bay - Trinity Bay (BB-TB), and Conception Bay - Southern Shore (CB-SS), 1987-90.

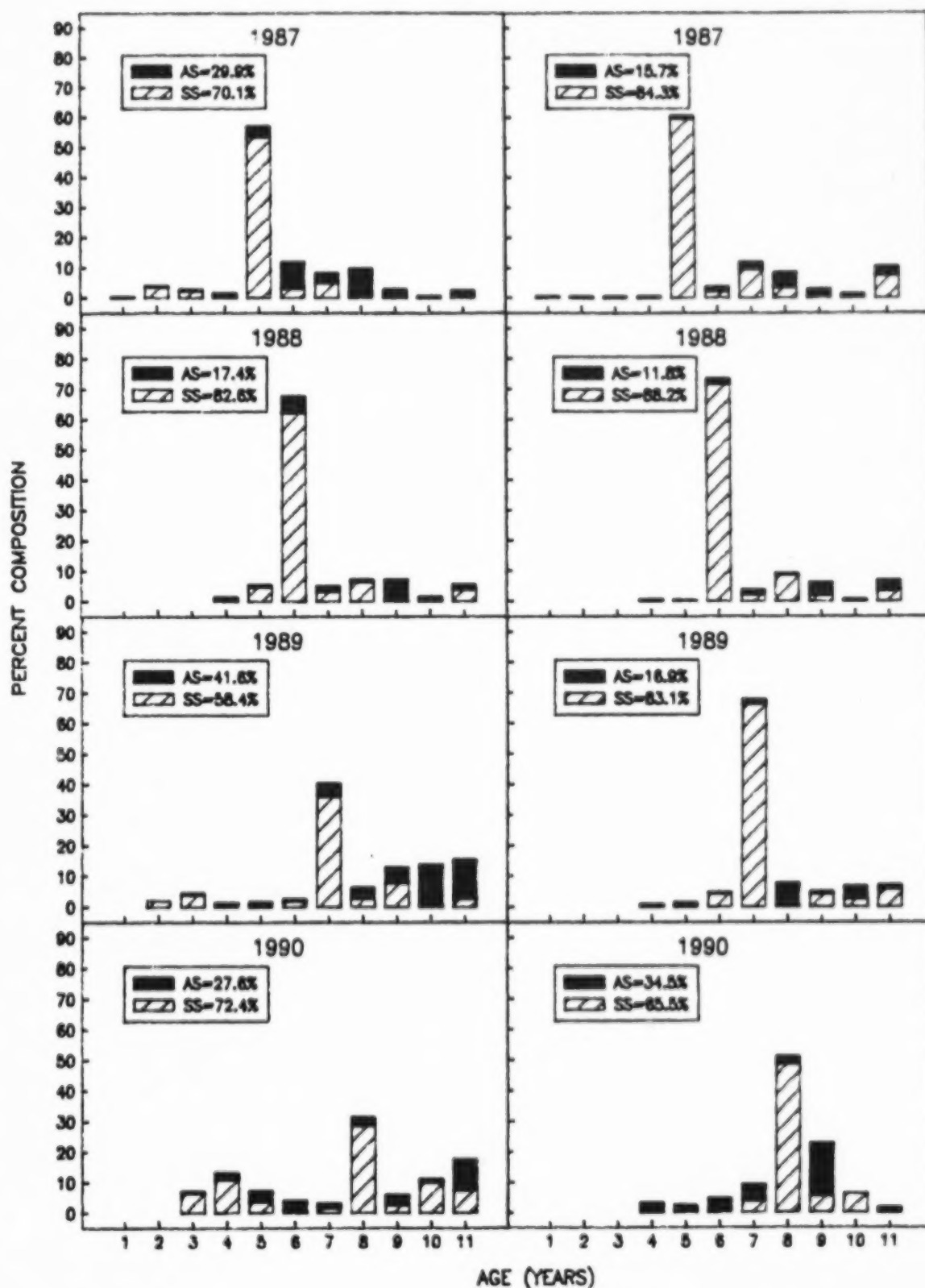


Fig.3. Age composition of herring from commercial fishery, St. Mary's Bay - Placentia Bay (SMB-PB), and Fortune Bay (FB), 1987-90.

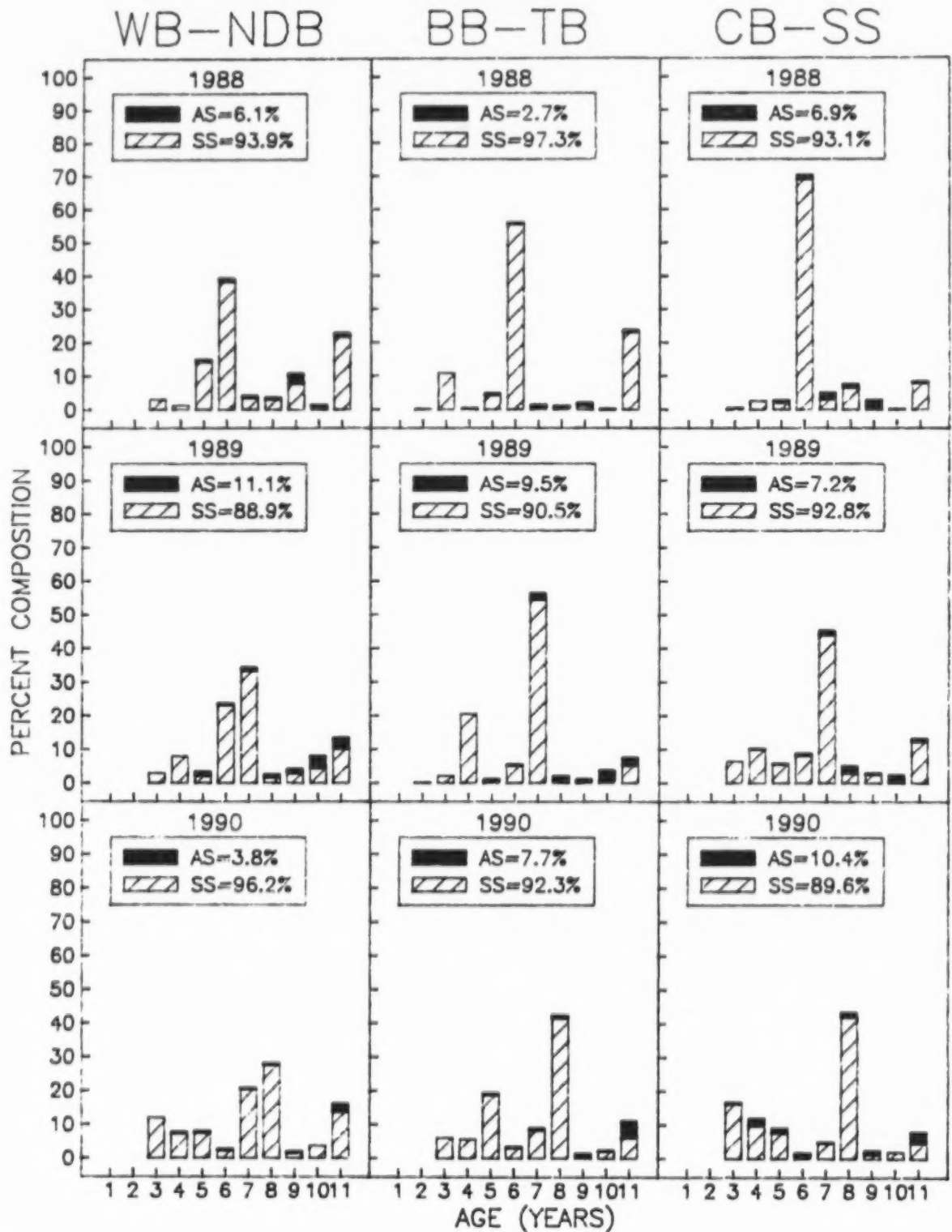


Fig. 4. Age composition of herring from research gillnets, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, and Conception Bay - Southern Shore, 1988-90, spring program only.

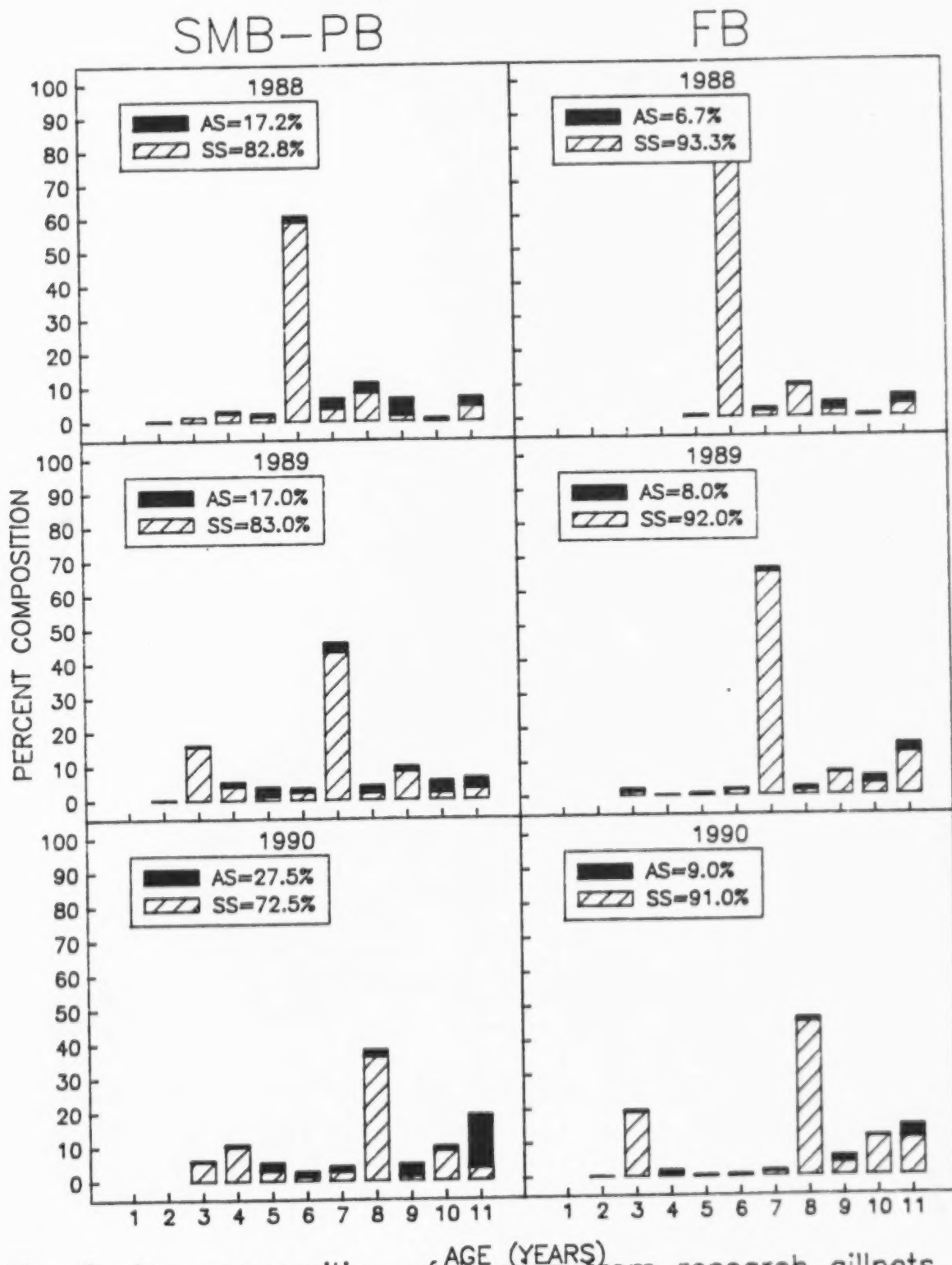


Fig. 5. Age composition of herring from research gillnets, St. Mary's Bay – Placentia Bay, and Fortune Bay, 1988–90, spring program only.

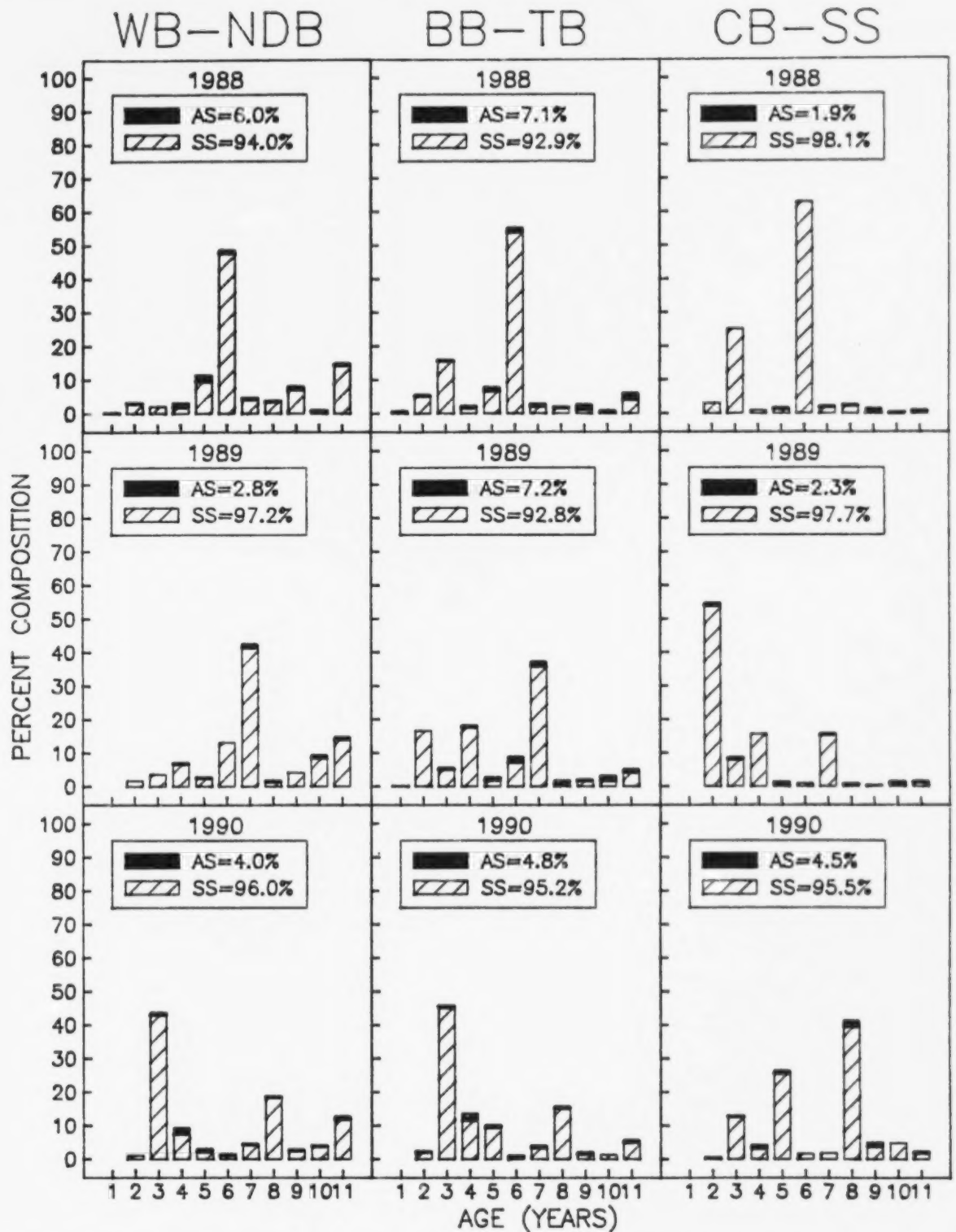


Fig. 6. Age composition of herring from research gillnets, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, and Conception Bay - Southern Shore, 1988-90, fall program only.

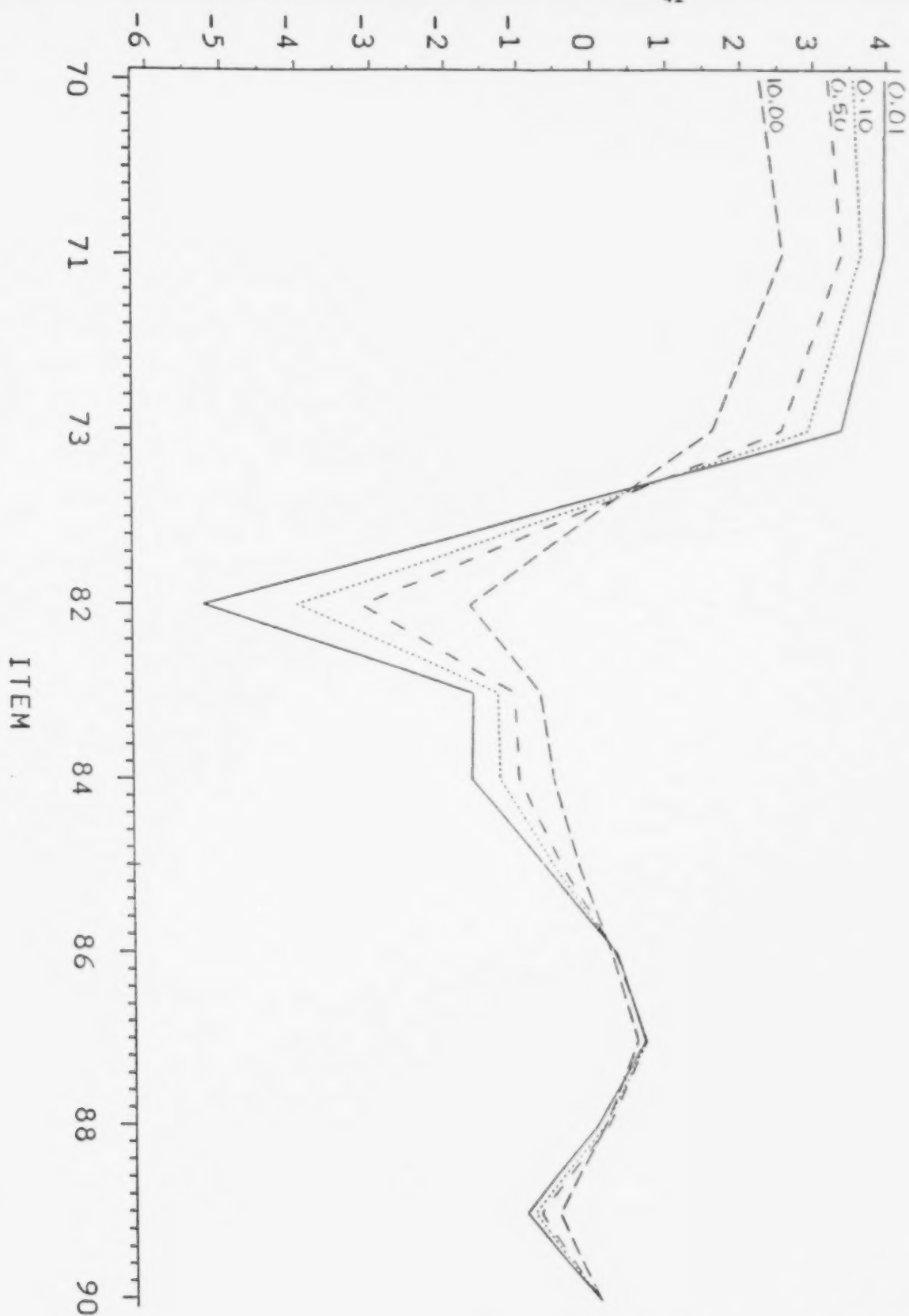


Fig. 7. Standardized annual catch rates, St. Mary's Bay-Placentia Bay spring program, from the general linear model, using different correction factors to account for occurrences of 0 catch.

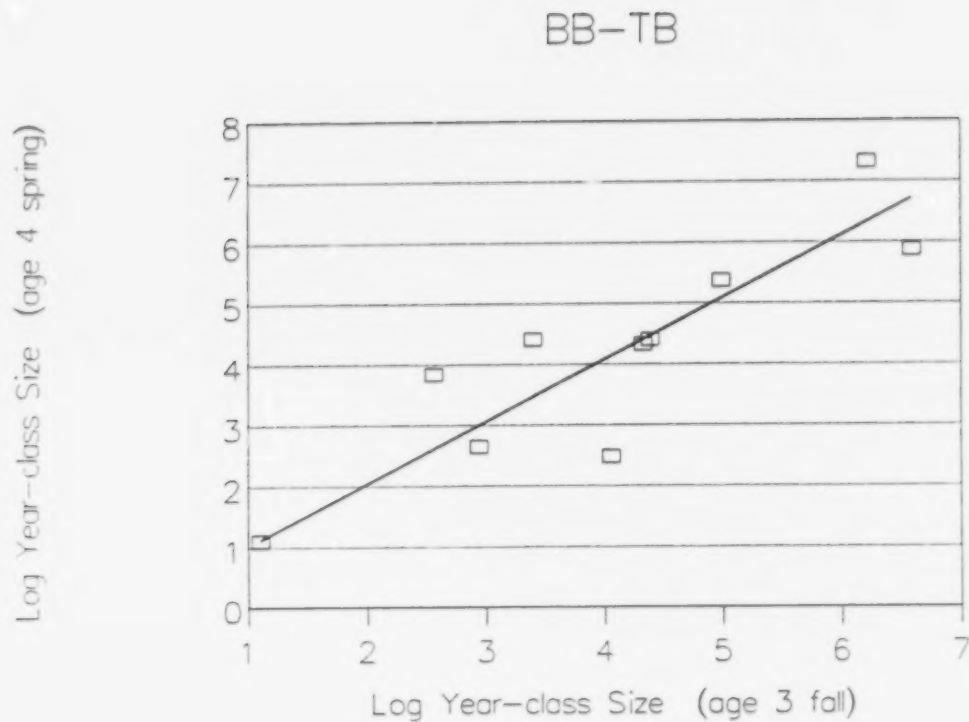
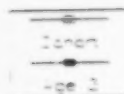
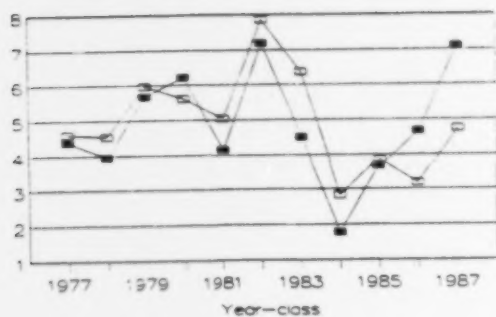


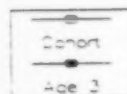
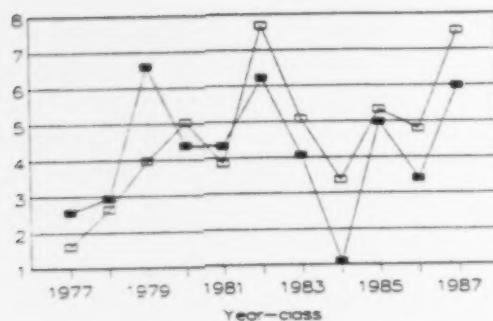
Fig. 8. The relationship between year-class size predicted at age 3 from the fall unstandardized research gillnet catch rates and at age 4 from spring research gillnet catch rates, for Bonavista Bay-Trinity Bay.

Log Year-class Size



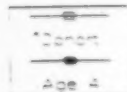
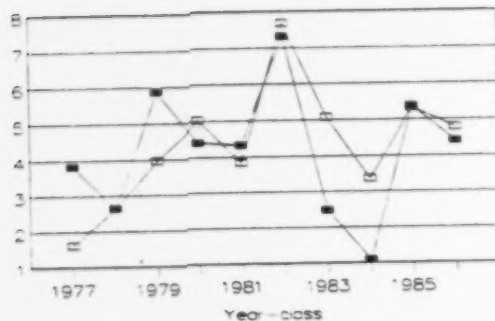
BB-TB

Log Year-class Size



BB-TB

Log Year-class Size



SMB-PB

Log Year-class Size

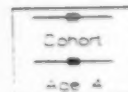
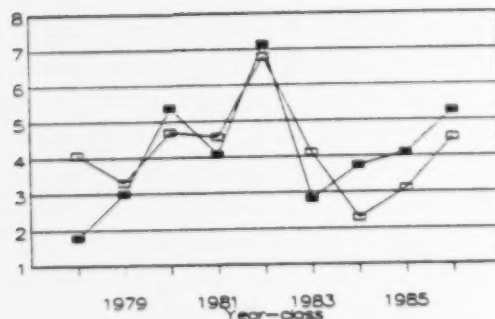
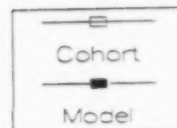
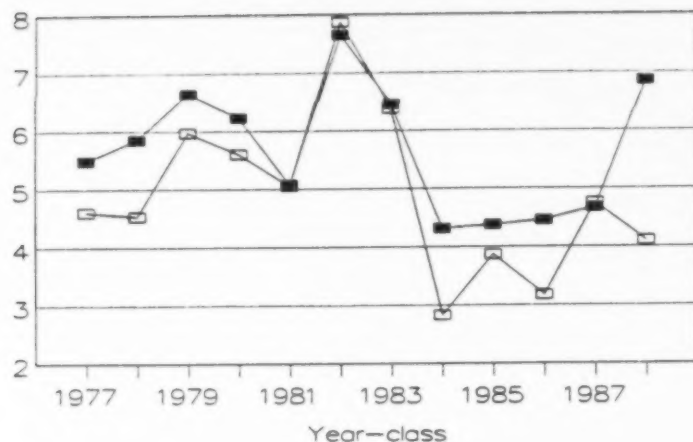


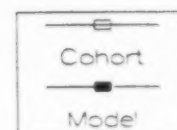
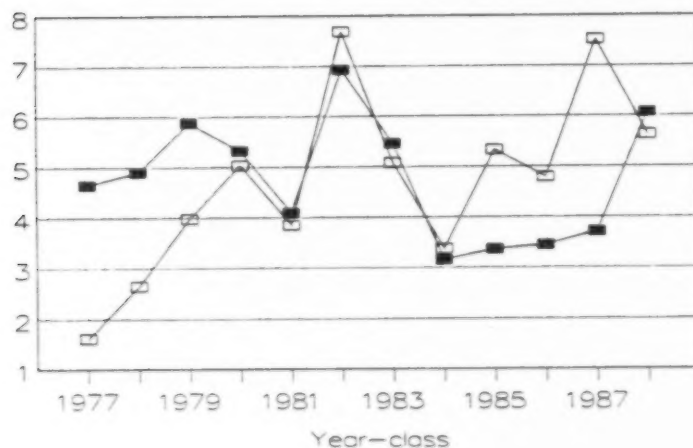
Fig. 9. Year-class sizes from cohort analysis using 1990 acoustic survey population numbers at age versus year-class sizes at age 3 from unstandardized fall gillnet catch rates and at age 4 from spring catch rates.

Log Year-class Size



BB-TB

Log Year-class Size



SMB-PB

Log Year-class Size

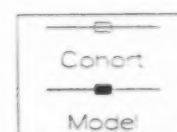
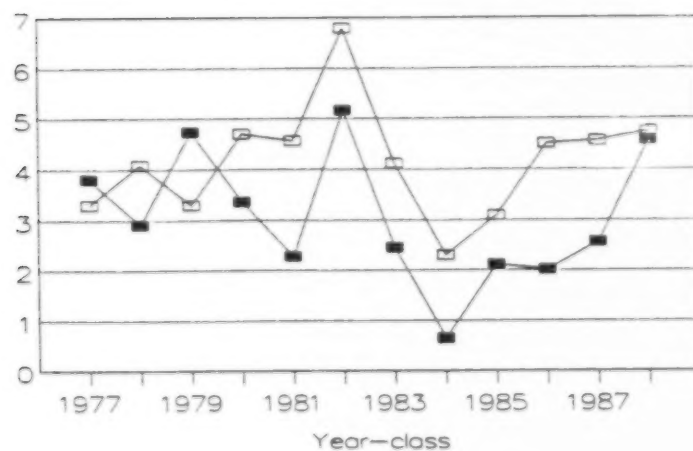
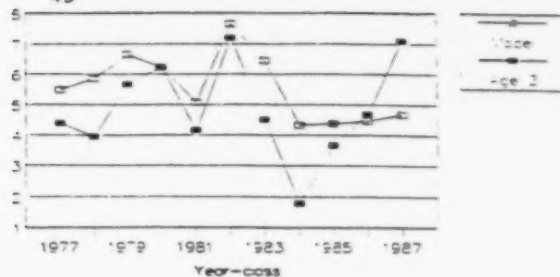


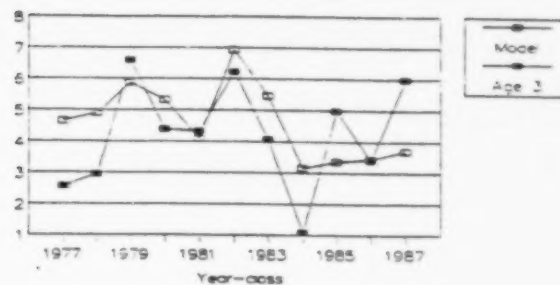
Fig. 10. Year-class size from cohort analysis using 1990 acoustic survey population numbers at age versus predicted year-class from the environmental model (Winters and Wheeler 1987).

Log Year-class Size



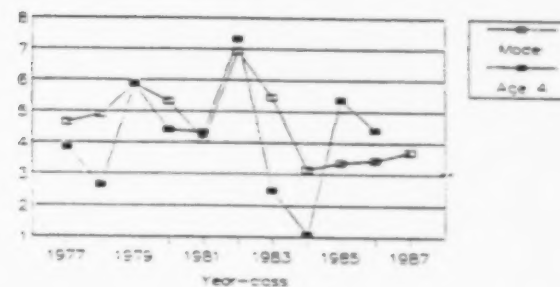
BB-T2

Log Year-class Size



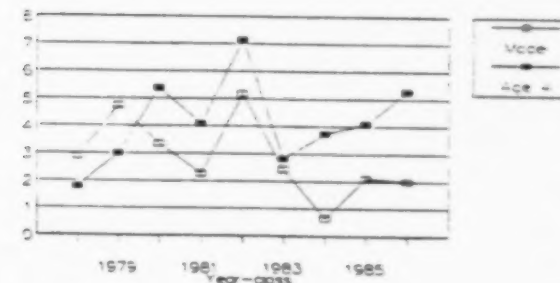
BB-TB

Log Year-class Size



WB-T2

Log Year-class Size



TB

Log Year-class Size

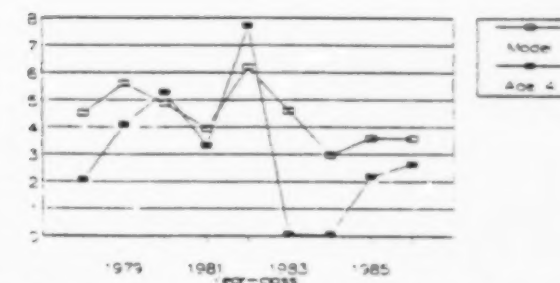


Fig. 11. Year-class sizes predicted from the environmental model (Winters and Wheeler 1987) versus year-class sizes at age 3 from unstandardized fall gillnet catch rates and at age 4 from spring catch rates.

